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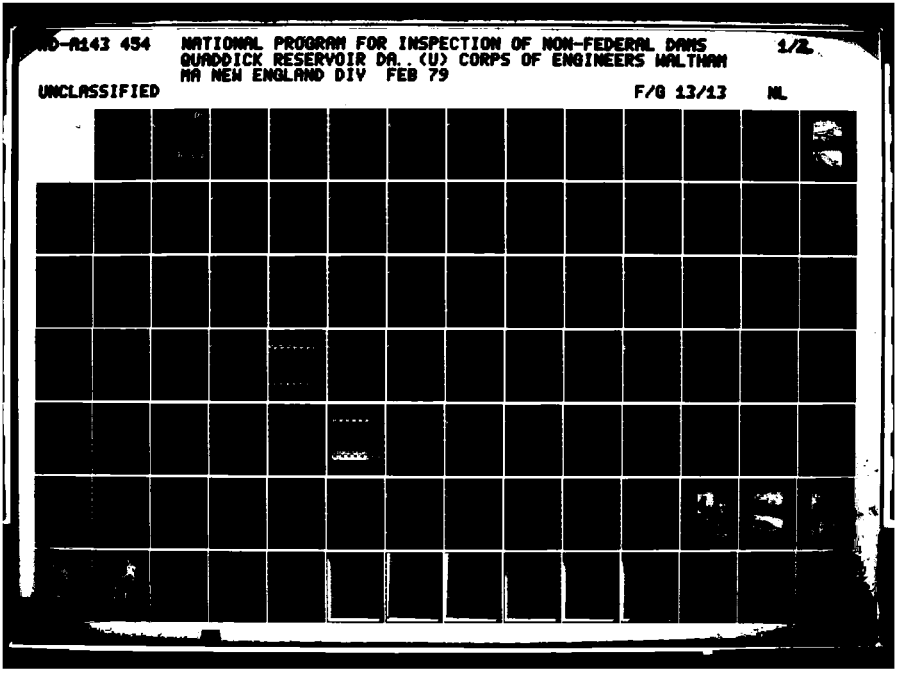
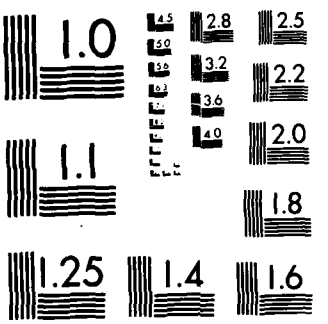
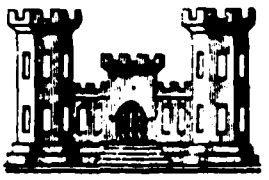




THAMES RIVER BASIN
THOMPSON, CONNECTICUT

QUADDICK RESERVOIR DAM
CT 00184

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

FEBRUARY, 1979

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Quaddick Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
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Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

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Thames River Basin
Thompson, Conn.
Quaddick Reservoir Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Quaddick Reservoir Dam is an earth embankment about 330 ft. long, with a maximum height of about 12 ft. It is 3 miles long and has a surface at normal storage of 428 acres. The dam and dike are judged to be in generally fair condition. The drainage area is about 24 sq. mi. and the maximum active storage to the top of the dam is 5,100 acre-ft.; the size classification is thus intermediate.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 25 1979

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

I am forwarding to you a copy of the Quaddick Reservoir Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, the State of Connecticut, Department of Environmental Protection, Hartford, Connecticut 06115, ATTN: Mr. Stanley J. Pac, Commissioner.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

QUADDICK RESERVOIR DAM

CT 00184

THAMES RIVER BASIN
THOMPSON, CONNECTICUT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	CT 00184
Name of Dam:	Quaddick Reservoir Dam
Town:	Thompson
County and State:	Windham County, Connecticut
Stream:	Fivemile River
Date of Inspection:	7 November 1978

BRIEF ASSESSMENT

Quaddick Reservoir Dam is an earth embankment about 330 ft. long, with a maximum height of about 12 ft. Two spillways, with a combined width of 78 ft., occupy a portion of this length. A dike is located in a saddle about 2,000 ft. east of the dam. The dam has a wet well intake structure with a 30 in. dia. outlet pipe controlled by a sluice gate.

Quaddick Reservoir is used for recreational purposes. It is about 3 miles long and has a surface at normal storage of 428 acres. The drainage area is about 24 sq. mi. and the maximum active storage to the top of the dam is 5,100 acre-ft.; the size classification is thus intermediate. A breach of the dam or dike could affect several homes and commercial establishments along Quaddick Road, and other local roads and U.S. Route 44 which cross the downstream Valley. With the possibility of some loss of life and the probability of serious economic losses, the dam has been classified as having a significant hazard potential.

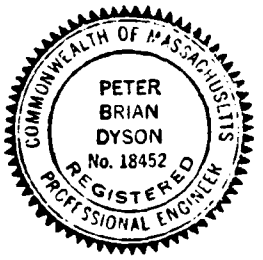
The dam and dike are judged to be in generally fair condition. The side walls of the west spillway appear to have been overtopped, resulting in some erosion of the embankment. The backfill along the east spillway has also settled. Most of the riprap protection downstream from both spillway chutes has been washed away. The masonry wall at the downstream end of the outlet pipe is in poor condition. Brush and saplings have become established downstream of the west abutment area, in the east spillway discharge channel and on the upstream slope. There are several areas of local erosion on the crest, upstream and downstream slopes, and some rodent burrows on the downstream slope. Seepage was noted below the toe in the right abutment area and through the masonry outlet wall.

The spillways are not adequate to pass the 0.5 PMF test flood without overtopping the dam and dike. The test flood would overtop the dam by about 1.3 ft and the dike by about 2.8 ft. The combined spillways would pass about 30 percent of the test flood without overtopping the dam or dike provided that the stoplogs were not installed on the west spillway crest.

Within one year of receipt of the Phase I Inspection Report, the owner, the State of Connecticut, should study and evaluate the following: 1) whether spillway modifications are required to increase capacity, improve flow and forestall an overtopping of the side walls; 2) whether stilling basins and/or channel armor should be provided downstream from the spillways and outlet pipe; 3) whether the use of stoplogs on the right spillway crest can be abandoned; and 4) ascertain whether the crest of the dike should be raised.

The owner should also carry out the following operational and maintenance procedures: 1) replace displaced riprap downstream of both spillway chutes with heavier material; 2) restore dam crest to grade in west abutment area; 3) restore eroded and/or settled areas of embankment crest and slopes; 4) eliminate rodent burrows and monitor embankment for further infestations; 5) monitor seepage below the toe of the dam and through the outlet wall; 6) remove brush and saplings from the toe of the embankment, the left spillway discharge channel and the upstream slope; 7) develop a formal surveillance and flood warning plan; and 8) institute procedures for an annual periodic technical inspection.

Peter B. Dyson
Project Manager



Frederick Esper
Vice President

This Phase I Inspection Report on Ouaddick Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph W. Finegan

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph A. McElroy

JOSEPH A. MCELROY, CHAIRMAN
Chief, NED Materials Testing Lab.
Foundations & Materials Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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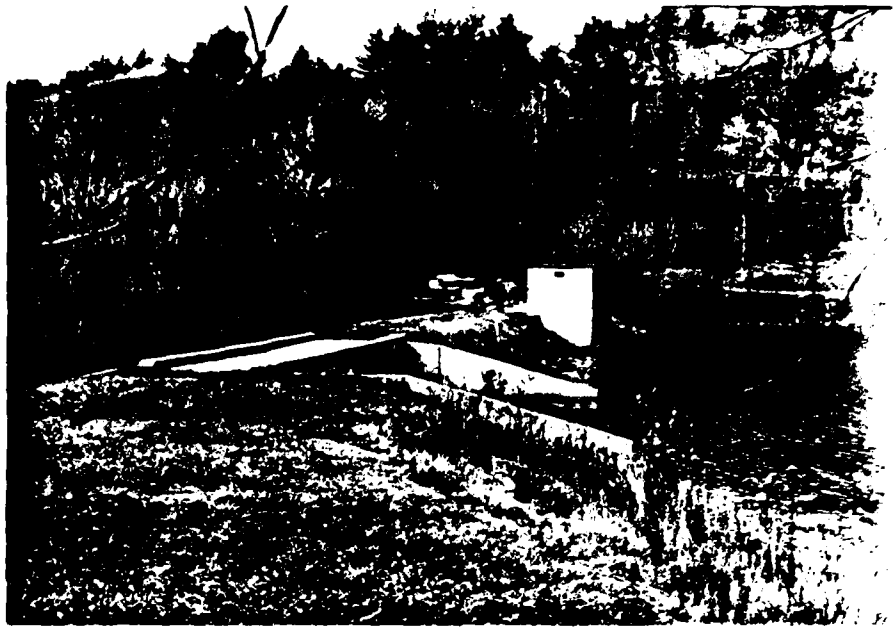
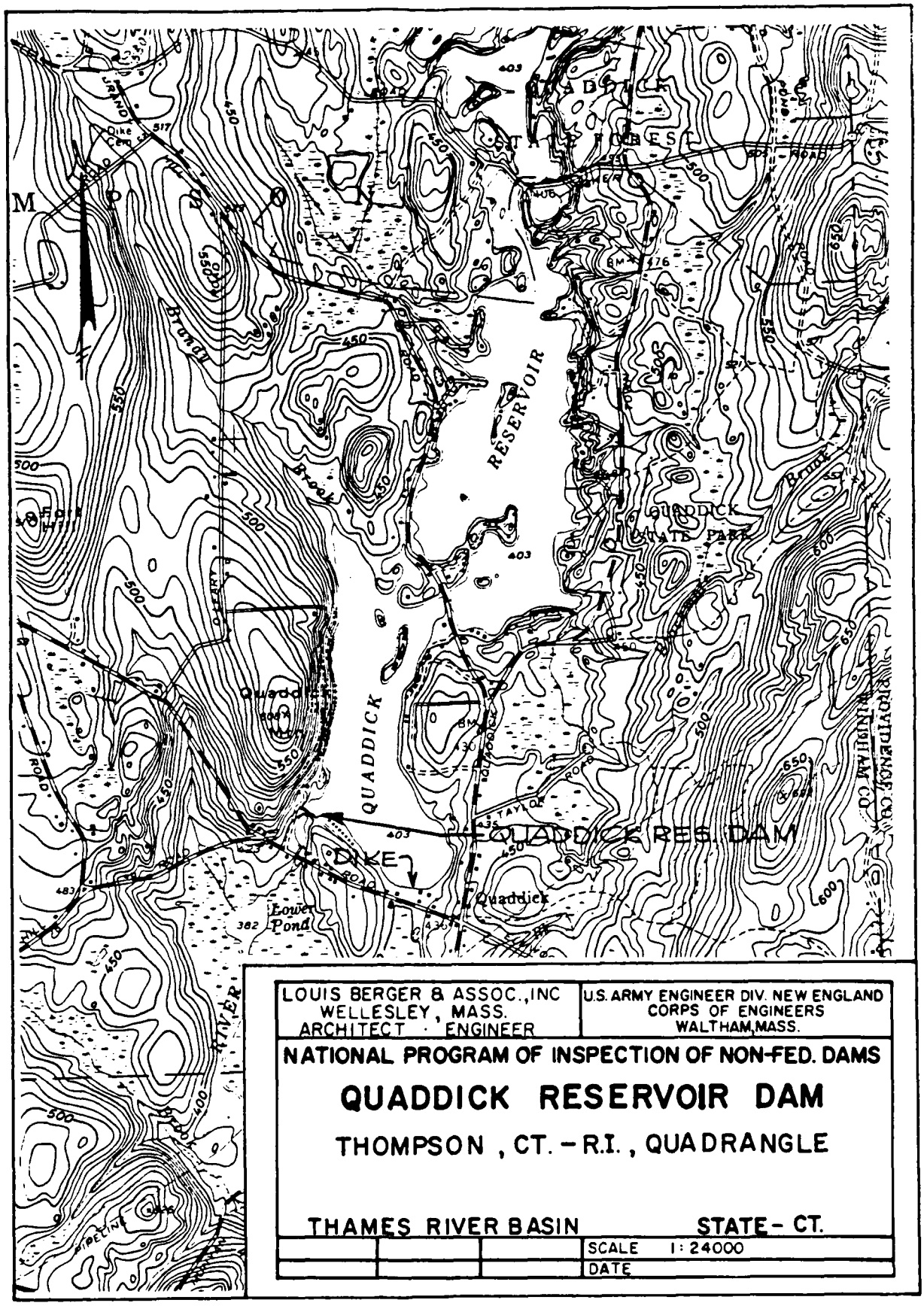
QUADDICK RESERVOIR DAM



Overview of dam from left abutment

Overview of dam from right abutment



LOUIS BERGER & ASSOC., INC WELLESLEY, MASS. ARCHITECT · ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

QUADDICK RESERVOIR DAM

THOMPSON, CT. - R.I., QUADRANGLE

THAMES RIVER BASIN — STATE - CT.

			SCALE 1:24000
			DATE

PHASE I INSPECTION REPORT

QUADDICK RESERVOIR DAM CT 00184

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Louis Berger & Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Louis Berger & Associates, Inc. under a letter of 27 October 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0371, Job Change No. 1, has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

3. Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

Quaddick Reservoir and Dam are located on Fivemile River, a tributary of the Quinebaug River, in northeastern Connecticut. The damsite is in the Town of Thompson, Windham County, about 3 miles southeast of the settlement of Thompson and immediately north of the village of Quaddick.

b. Description of Dam and Appurtenances

1. Dam and Dike

Quaddick Dam consists of an earth embankment about 330 ft. long. Two spillways, with a combined width of about 78 ft., occupy a portion of this length. The dam has an irregular profile and top width, the elevation of its crest varying from about 407.5 to 408.0 MSL and its top width averaging about 15 ft. Upstream and downstream slopes are indicated to be 2½ horizontal to 1 vertical and 2 to 1, respectively, but portions of the upstream slope have been eroded or have sloughed away and are as steep as 1 to 1 in some places (see Appendix C). The lower part of the upstream slope is riprapped and the top 3 to 4 ft. is grass sodded. The top of the dam and the downstream slope are also sodded. Where the upstream slope had been severely eroded, rock-filled gabions have been placed as a protection against further erosion (see profile on Figure 1, Sheet D-1, in Appendix D).

A dike has been constructed along the rim at the reservoir across a low saddle about 2,000 ft. east of the main dam. The dike is about 190 ft. long and has a maximum height of about 5 ft. Its crest level is about 1.5 ft. lower than the crest of the dam; about 150 ft. of the left and right abutments of the dike are also 1.5 ft. lower than the crest of the dam. The saddle area below the dike connects with the broad swampy area of the Fivemile River below the main dam.

2. Spillways

The dam was originally provided with a single spillway, constructed toward the west end of the dam. This is built of ashlar stone masonry and consists of a wide level crest, stepped apron, and abutment walls. Modifications were made to this spillway in 1965, when a new bridge was provided across the spillway, the piers for stoplogs were reconstructed, and the lower step of the apron (where the stone blocks were loose) was strengthened by covering the blocks with a reinforced concrete slab and end sill. The crest of this spillway is at elevation 402 MSL, and the clear opening length between the 2 ft. 4 in. high by 1 ft. wide piers is about 35.6 ft. The length of the clear opening above the piers is about 40.5 ft. (see details on Figure 1, Sheet D-1).

In 1965 it was decided to provide additional spillway capacity, by replacing an old sluiceway structure near the east end of the dam with a second spillway. This spillway has its crest 1 ft. higher than that of the right spillway and has an unobstructed crest length of 35 ft. A 12 in. wide center pier supports an overspanning bridge. The whole structure is constructed of reinforced concrete, its profile consisting of a sloping gravel-covered approach floor, a 12 in. wide concrete overflow sill with its top at elevation 403, a sloping concrete chute floor terminating with a vertical step, and a riprapped outlet channel. A subsurface drainage system is provided under the chute floor. A profile of this spillway is also shown on Figure 1, Sheet D-1.

3. Outlets

The original outlets consisted of a 1.5 by 2 ft. conduit located to the right of the spillway, and a 30 in. dia. outlet pipe located to the left of the spillway. Additional outlet capacity was available through the sluiceway near the left end of the dam.

When the 1965 modifications were made, the stone conduit to the right of the old spillway was plugged with concrete, the sluiceway at the left end of the dam was replaced by the second spillway, and the existing 30 in. dia. pipe outlet was modified by adding a gatehouse tower at the intake end.

The intake structure is a 5 ft. 4 in. square wet well tower at the upstream toe of the dam. A 30 in. dia. inlet at invert elevation 393 MSL is provided at the reservoir side of the structure, with inflows regulated by a 30 in. dia. upstream seal sluice gate, controlled from a hoist stand housed in the gatehouse at the top of the structure. Metal stoplog guides are provided for insertion of stoplogs across the well at about midpoint, thereby providing a riser well and drop inlet for regulating the reservoir level. Flow regulation is obtained by opening the slide gate at the inlet to the well, after inserting stoplogs to a level which will provide the required overflow head over the stoplog needed for specific releases.

The 30 in. dia. pipe is carried under the dam to the downstream toe, where it terminates through a rubble masonry wall carried along the toe of the dam. The outlet then discharges directly into the downstream streambed, without any protective downstream structure.

c. Size Classification

Quaddick Dam is about 12 ft. high above streambed, impounding about 2,100 acre-ft. to spillway crest level and about 5,100 acre-ft. to the top of the dam. In accordance with the size and capacity criteria given in Recommended Guidelines for Safety Inspection of Dams, storage capacity governs and therefore the project is classified as intermediate in size.

d. Hazard Criteria

A breach failure of Quaddick Dam or dike would release water down Fivemile River, which traverses along about 6 miles of wide, boggy valley to the Villages of Pineville and Ballouville. There are some homes and commercial establishments immediately below the dam and dike, and along the reservoir rim adjacent to the dike, but the rest of the downstream valley to Ballouville is not inhabited. The gradient of the Fivemile River for this reach is about 4 ft. per mile.

An assessment of the valley topography along the 6 mile reach downstream indicated that the valley area is about 500 acres. Thus, a storage depth of about 6.5 ft. in this valley could absorb the entire storage volume of Quaddick Reservoir. If the dam was breached during a storm of test flood magnitude, however, a storage depth of 20 to 25 ft. might be expected (see Section 5.1(e)).

A number of roads cross the valley below Quaddick Dam, including U.S. Route 44, as noted in Section 3.1e. Restricted waterways under the bridge crossings could result in the roadways being threatened by major flows down the river.

It therefore appears that a sudden breach of the dam or dike would probably cause some loss of life and some economic losses. Consequently, Quaddick Reservoir Dam has been classified as having a significant hazard potential, in accordance with the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

Quaddick Reservoir Dam is owned by the State of Connecticut, Department of Environmental Protection, Water and Related Resources Section. Before being acquired by the State about 1958, the dam was owned by Pawdrell and Alexander.

f. Operator

Mr. John Olson, Regional Manager
State of Connecticut DEP
Region IV Headquarters
RFD No. 1 (Sheldon Road)
Voluntown, CT 06384
Telephone: (203) 376-2513

g. Purpose of Dam

The dam impounds a lake used for recreational purposes.

h. Design and Construction History

No information was recovered regarding the design or construction of this dam, but it appears to have been built in the nineteenth century. About 500 ft. downstream there is a smaller dam, known as South Quaddick Reservoir Dam or Quaddick Reservoir Pond Dam, suggesting that the combined facilities were originally operated as a mill dam or for waterwheel power generation.

A second spillway and a new outlet structure were constructed by the State in 1965.

i. Normal Operational Procedures

There are no formal operational procedures. The State DEP Region IV Manager is responsible for operating the dam. The 12 in. high stoplogs on the old spillway are installed during the summer months.

1.3 Pertinent Data

a. Drainage Area

The drainage area above Quaddick Dam covers about 23.9 square miles, being about 7.7 miles long, with a maximum width of about 4 miles at its mid-length. Quaddick Reservoir occupies about 3 miles of the basin length and is fed by seven separate streams, which drain into the lake along its sides and upper reaches. Streams draining directly into the lake include: Brandy Brook and Janson Brook to the west; Blackmore Brook and Robbins and Croff Farm Brooks to the east;

several small brooks draining the area to the east and west immediately adjacent to the lake; and Fivemile River to the north. Tributary streams flowing into the Fivemile River are: Rocky Brook and its East Fork Tributary; Jerry Swamp Pond; Long Pond and Little Pond inlets. A sketch of the area showing the location of the streams and sub-drainage areas is illustrated on Sheet D-2 in Appendix D.

The topography of the drainage areas is generally heavily wooded, rolling terrain, with occasional small pondages and swampy areas along the stream courses. The rim of the basin rises to about 200 ft. above the stream valley. The longest water course upstream from Quaddick Reservoir measures about 5 miles, with an average slope of about 31 ft. per mile. Tabulated on Sheet D-2 are the lengths and slopes of the various streams entering Quaddick Reservoir.

The area is sparsely populated, except for homes along the shores of Quaddick Reservoir and Little Pond, and in the Village of East Thompson.

b. Discharge at Damsite

1. Outlet Works Conduit

The outlet works pipe has its inlet invert at elevation 393 MSL, to provide a head of about 9 ft. with the reservoir at spillway crest level (provided that stoplogs are not installed in the inlet well to the extent that outlet control is dictated by weir control instead of pressure pipe control in the downstream pipe). With stoplogs removed, the discharge at normal reservoir head is estimated to be about 62 cfs. At this discharge, reservoir evacuation can be realized at the rate of about 123 acre-ft. per day, requiring about 3.3 days to lower the reservoir 1 ft.

An outlet discharge curve is shown on Sheet D-3, Appendix D.

2. Maximum Known Flood at Damsite

No records are available of flood inflows into Quaddick Reservoir, nor of spillway releases and surcharge heads during such inflows.

3. Spillway Capacity

Spillway discharge curves have been prepared for the right spillway, with or without 12 in. stoplogs in place, for the left spillway, and for flows over the dam and dike. Discharge curves are shown on Figure 2, Sheet D-4, Appendix D. Computations are shown on Sheet D-5. Pertinent discharges are as follows:

a. Ungated spillway capacities at top of dike - 1450 cfs @ El. 406.0
b. Ungated spillway capacities at top of dam - 2,500 cfs @ El. 407.5
c. Ungated spillway capacities at test flood elevation - 3,600 cfs @ El. 408.76
d. Stoplogged spillway capacity at top of dam - 2,200 cfs @ El. 407.5
e. Total project discharge at test flood elevation - 12,700 cfs @ El. 408.76

c. Elevation (ft. above MSL)

1. Streambed at centerline of dam - 395±
2. Maximum tailwater - Not computed.
3. Upstream portal invert outlet pipe - 393.0
4. Recreation Pool - Not applicable
5. Full flood control pool - Not applicable
6. Spillway crest - Left spillway 403.0
   Right spillway 402.0
7. Design surcharge - Unknown
8. Top of dike - 406
9. Top of dam - Varies: 407.5 to 408
10. Test flood design surcharge - 408.76

d. Reservoir

1. Length of maximum pool - 16,000 ft. (3.03 miles)
2. Length of recreation pool - Not applicable.
3. Length of flood control pool - Not applicable.

e. Storage (acre-ft.)

1. Recreation pool - Not applicable.
2. Flood control pool - Not applicable.
3. Spillway crest pool El. 402 - 2,140
4. Top of dike El. 406 - 4,183
5. Top of dam El. 407.5 - 5,100
6. Test flood pool El. 408.76 - 5,980

... oir ... acres)

1. Recreation pool - Not applicable.
2. Flood control pool - Not applicable.
3. Spillway crest - Left spillway 470
   Right spillway 428
4. Test flood pool El. 410.85 - 796
5. Top of dike El. 406 - 595
6. Top of dam El. 407.5 - 655

g. Dam

1. Type - Earth embankment
2. Length - 330 ft.
3. Height - 12 ft.
4. Top width - Varies, 15 ft. average
5. Side slopes - Upstream varies between 2½ horizontal to 1 vertical and 1 to 1
   Downstream 2 to 1
6. Zoning - Unknown
7. Impervious core - Unknown
8. Cutoff - Unknown
9. Grout curtain - Unknown.
10. Other - Nil.

Dike

1. Type - Earth embankment
2. Length - 190 ft.
3. Height - 5 ft.
4. Top width - 10 ft.
5. Side slopes - 2 horizontal to 1 vertical
6. Zoning - Unknown
7. Impervious core - Unknown
8. Cutoff - Unknown
9. Grout curtain - Unknown
10. Other - Nil.

h. Division & Regulating Tunnel

None

i. Right Spillway

1. Type - Broad crested weir with stoplog piers, stepped downstream chute.
2. Length of weir - 35.6 ft. total of clear openings between flashboard piers
   40.5 ft. total of clear openings above flashboard piers
3. Crest elevation - 402 MSL
4. Gates - None.
5. Upstream channel - Approach channel through top of dam

6. Downstream channel - Stepped channel on 2 to 1 slope indented in downstream face of dam. No stilling basin or channel below stepped apron.
7. General - Provision for insertion of 12 in. stoplogs at crest.

Left Spillway

1. Type - Crest sill and sloping downstream chute
2. Length of weir - 35 ft. clear opening
3. Crest elevation - 403 MSL
4. Gates - None
5. Upstream channel - Approach channel through top of dam
6. Downstream channel - Sloping downstream chute terminating with vertical step. Riprap channel below step.
7. General - Nil.

j. Regulating Outlet

1. Invert - Entrance Elev. 393 MSL; exit Elev. 392 MSL
2. Size - 30 in. dia. pipe
3. Description - Wet well tower with stoplogs to form riser well and drop inlet (see Para. 1.2b(3))
4. Control mechanisms - 30 in. dia. upstream seal intake gate in gatehouse at top of shaft. Handwheel operated hoist. Stoplogs inserted at center of wet well shaft to regulate reservoir level.
5. Other - Nil.

SECTION 2 - ENGINEERING DATA

2.1 Design

No data on the design of the dam and its original appurtenances, or the dike, has been recovered and probably none exists. The second (east) spillway and new outlet structure gatehouse were designed by Chandler and Palmer, Engineers, Norwich, CT, in 1963. Drawings for these two structures are included in Appendix B.

2.2 Construction

No information was recovered regarding construction of the dam and dike. The new outlet structure and left spillway were built in 1965 (see Appendix B).

2.3 Operation

Operation of the dam by the State DEP, Region IV, is on an informal, ad hoc basis to satisfy the recreational interests of lake users.

2.4 Evaluation

a. Availability

Since the only engineering data available are plans of the second spillway and outlet structure, an assessment of the structural stability and safety of the embankment cannot be made.

b. Adequacy

The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Validity

The validity of the engineering data acquired covering the dam's appurtenant structures is considered acceptable and is not challenged.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General

The visual inspection of Quaddick Reservoir Dam took place on 7 November 1978. At that time the reservoir was about 3 in. above normal storage level, with a small discharge occurring over the right spillway crest. There were no stoplogs on the right spillway crest at the time of the inspection.

The dam is an earth embankment about 330 ft. long and about 12 ft. high. There are two spillways spanned by bridges at the crest of the dam, and a control tower and gatehouse for a 30 in. dia. outlet pipe.

The dam and its appurtanances were judged to be in generally fair condition.

b. Dam and Dike

The dam appeared to be reasonably well tended, with evidence of a continuing program of growth cutting except downstream of the right embankment section. At 10 ft. downstream from this section, the terrain was overgrown, poorly drained, with evidence of seepage of rust colored water, flowing at about 0.1 gpm toward the main channel (Appendix C, Photo No. 1).

The right abutment (west) embankment was in good condition, with no leaks evident at the embankment itself or where it joins with the right spillway's masonry retaining wall. The crest of the dam was lower in this section and showed heavy vehicular wear. Riprap on the upstream face, particularly on the right embankment, was of rather small size, perhaps 1 cu. ft. on the average, and was somewhat randomly placed about 2 to 3 ft. below the crest. The crest itself was in good condition except as noted (see overview photos).

In 1974 the upstream slope of the dam between the west spillway and the outlet control house was reported as having sloughed and become eroded to a depth of more than 5 ft. This area was repaired in 1976 by the placement of two rock-filled wire mesh baskets (gabions) at about

normal reservoir level (Appendix B). The gabions appeared to be sound, but immediately above them there was evidence of sloughing and erosion of the embankment. The upstream slope of the embankment between the outlet house and the left abutment was covered above the water line with small riprap, except for the upper 3 ft. which is sodded. To the left of the outlet tower, some brush and young tree growth was becoming established on the riprapped upstream slope.

On the left side of the masonry spillway retaining wall, a considerable washout of material on the downstream face of the dam was evident near the toe, apparently caused by overtopping from spillway flows. The masonry wall at the toe of the dam to the left of the outlet pipe was becoming badly ravelled. Minor leakage, estimated at about 0.1 gpm, was noted through the masonry toe wall about 3 ft. to the left of the right spillway wall, but no apparent seepage was noted along the remainder of the toe between the spillways. Several rodent burrows were observed near the toe of the dam east of the right spillway.

The upstream face of the dam to the left of the left spillway was sparsely covered with small riprap, and was becoming invaded with young growth of brush and trees.

Some settlement of backfill adjacent to the side walls of the left spillways has taken place, having evidently occurred since the 1965 construction, the top of the backfill being 1 to 3 in. below the top of the walls and the crest of the dam.

An earth dike closes off a low swale along the reservoir rim about 2,000 ft. east of the main dam. The dike spans a distance of about 190 ft., with its crest about 1.5 ft. lower than the main dam. The dike has a top width of about 10 ft., with approximately 2 to 1 side slopes. The area for about 150 ft. to each side of the dike is at about the same elevation as the top of the dike, and a number of homes are sited along this reach of the reservoir shoreline. The swale area below the dike appeared quite marshy, but it could not be ascertained how much of the swampiness was caused by seepage either through or under the dike (see Appendix C, Photo Nos. 9 & 10).

c. Appurtenant Structures

1. West Spillway

The west spillway is an old structure, built principally of ashlar masonry (Appendix C, Photo No. 3). There are later additions of concrete at the overflow weir and piers, stepped apron toe and spanning bridge (Appendix C, Photo No. 4). Stoplogs were not in place and about 3 in. of flow was being discharged through the spillway. This flow was cascading down the horizontal steps of the downstream apron, so that the condition of the floor could not be observed. The 1965 repair work to the apron involved anchoring the loose blocks in the lower part of the apron and covering the last step with reinforced concrete paving.

The downstream apron is indented into the dam embankment section, with the steps placed about 4 ft. below the slope of the downstream face of the dam. The 4 ft. high side retaining walls are of large ashlar block construction. Judging by the appearance of the adjacent embankment slope, the walls are frequently overtopped and the fill material then becomes eroded.

Some riprap downstream from the spillway chute was visible, but the river bottom below the spillway outlet appeared to be inadequately armored to forestall a deep erosion pool in the event of large spillway releases (Appendix C, Photo No. 2).

2. East Spillway

The east spillway was constructed in 1965; except for some cracking and spalling, it appeared to be in good condition (Appendix C, Photo Nos. 5 & 6). There was a large open crack, about ¼ in. wide at about the midpoint of the right inlet wall, undoubtedly owing to an unequal settlement of the wall footing. A large spall has occurred in the left downstream retaining wall, at the contraction joint about 14 ft. downstream from the crest. This spall was apparently the result of unequal deflections of the two adjacent wall panels, or because of binding owing to improper alignment of the joints during construction. Some spalling was also noted at the horizontal joint in the lower step, between the horizontal floor slab and the end wall below the slab.

As noted in Para. 3.1b, settlement was evident along both side walls of this spillway, perhaps owing to poor consolidation of the backfill during construction in 1965. This condition has produced low points in the crest of the dam at the junction of the dam and spillway walls.

Riprap was specified on the design drawings downstream from the vertical step, to be placed to a level near the top of the step. Such riprap as was evident has washed down to about 3 ft. below the step (Appendix C, Photo No. 7). This condition was noted in the March 2, 1970, inspection report by John J. Mozzochi & Assoc. with the suggestion that the riprap be replaced. It is not known whether this suggestion was carried out or whether the riprap has since become eroded again.

Riprap downstream from the spillway outlet was noted, but it does not appear to be of such a size as to prevent the erosion of a large downstream hole, in the event of a large outflow through the spillway.

3. Outlet Works

The outlet structure was rehabilitated in 1965 with the addition of an intake structure and gatehouse. This structure was noted as being in good condition. The inlet gate was not operated, and the stoplog wall was not installed in the well at the time of the inspection.

At the downstream end of the 30 in. dia. outlet pipe, the masonry wall at the toe of the dam through which the pipe discharges appeared to be in poor condition, with some masonry blocks being dislodged (Appendix C, Photo No. 8). Its continued unravelling might threaten the toe of the dam, in the event of failure occurring during releases through the outlet.

The outlet discharges impinge directly onto the streambed below the dam and large flows could erode a deep hole immediately below the dam. No armoring by riprap below the outlet was observed.

d. Reservoir Area

Quaddick Mountain is situated on the right abutment of the reservoir immediately upstream from the dam, rising to a height of 200 ft. above the reservoir on about a 3 to 1 slope. No evidence was noted which would indicate potential instability of this slope; however, the geology at the site was not studied in this respect. Slopes surrounding the remainder of the reservoir are moderate and appeared to be stable.

Many homes along the shore of Quaddick Reservoir, and on islands and causeways within the reservoir, appear to be built near or below the freeboard space. These homes could be affected by a reservoir rise owing to a large inflow.

e. Downstream Channel

Remains of a low dam, about 500 ft. downstream from Quaddick Reservoir Dam, form a pondage which backs up almost to the toe of Quaddick Dam. The channel between the two dams is heavily overgrown and would tend to clog and cause a backwater for large outflows from the reservoir. Quaddick Road crosses the river channel about 700 ft. below the dam. The restricted waterway under the road would also contribute to the backwater condition. These effects would work favorably to form a tailwater below the dam and thereby aid in energy dissipation of the spillway outflows, but such an advantage would be lost if the lower dam and roadway were to be overtopped and washed out. Though no computations were made to estimate the discharge which might wash out the lower dam and road, visual observations pointed to a probable failure of these facilities at a discharge far less than the capacities of the spillways at the dam.

As noted in Section 1.2d, the reach of Fivemile River for a distance of 6 miles below the dam flows through a marshy valley, with little development except at the reservoir itself. Little if any damage to homes and commercial establishments would result from large flows down this reach of the river. Several local roads and U.S. Route 44, however, cross the valley with restricted waterway openings.

3.2 Evaluation

Quaddick Reservoir Dam and appurtenant structures appear to be in generally fair condition.

Both spillways are constructed through the dam embankment and a failure of either of these structures could result in a breaching of the dam. The west spillway walls are low and any major flow through the spillway would overtop the chute and apron walls, leading to erosion and possibly failure of the dam. Although more substantially built, the east spillway walls are also low and subject to overtopping during large outflows.

No stilling devices have been provided downstream from the spillway chutes and outlet pipe. For major outflows, deep erosion pools would result immediately at the toe of the dam. Such erosions could undermine the dam and invite a breaching from this cause.

The visual inspection has adequately revealed key characteristics of the dam as they may relate to its stability and integrity.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

The Connecticut Department of Environmental Protection, Region IV, Voluntown, operates the dam on an ad hoc basis. There appear to be no formal operating procedures. 12 in. high stoplogs are installed on the right spillway crest, which is 1 ft. lower than the left spillway crest, during the summer months.

4.2 Maintenance of Dam

According to CT DEP Region IV staff, maintenance is carried out as required by State forces.

4.3 Maintenance of Operating Facilities

The stoplog slots above the right spillway appear to be adequately maintained. The gatehouse is in good condition and kept locked. The gate is modern and appears to be in good order.

4.4 Warning System

No warning system is in effect at Quaddick Reservoir Dam.

4.5 Evaluation

Although little is known about construction of the dam, the rehabilitation of the operating devices in 1965 is adequately documented. The use of stoplogs to raise the normal storage in the reservoir during the summer months reduces the ability of the project to handle large magnitude floods. Unless the stoplogs are removed before a flood event, the surcharge capacity is reduced by 400 acre-ft. and the spillway capacity is also reduced (see Figure 2, Sheet D-4).

Maintenance involves periodic growth removal from the embankment, repair of damage to the crest and slopes, and surveillance regarding seeps, animal burrows, etc.

A formal warning and emergency evacuation system should be developed.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General

Quaddick Dam is an earth embankment structure impounding a normal storage of about 2,100 acre-ft. to the crest of the west spillway with an additional 2,000 acre-ft. of surcharge space to the top of the east dike and 3,000 acre-ft. to the top of the dam. The two spillways are capable of discharging about 1,500 cfs with surcharge to the top of the dike and about 2,500 cfs with surcharge to the top of the dam.

The general topographic characteristic of the basin is best described as rolling to mountainous terrain, for which the March 1978 NED Preliminary Guidance Report gives a suggested CSM value for a 24 square mile drainage area of about 1,400 to 1,700. On this basis, the peak inflow into Quaddick Reservoir would be approximately 33,000 to 40,000 cfs. The more detailed analysis given in Para. 5.1(e) was undertaken to ascertain an inflow value based on more specific basin criteria.

b. Design Data

No design data was recovered for this dam.

c. Experience Data

No records are available in regard to past operation of the reservoir or of surcharge encroachments and outflows through the spillway or outlet. The maximum past inflows are unknown.

d. Visual Observations

No evidences which would indicate possible high flows through the reservoir or in the downstream channel have been noted or recorded. As noted in Section 3.1(e), the state of the adjacent embankment slope indicates that the west spillway walls are frequently overtopped.

e. Overtopping Potential

1. Drainage Areas

Quaddick Reservoir is fed by a number of small, short streams draining separate areas adjacent to and surrounding

the reservoir, rather than the typical case of drainage from a long single river. Therefore, to analyze the runoff on the basis of a single river runoff would not recognize the specific characteristics peculiar to this basin.

Seven separate streams feed directly into the reservoir, and one stream has a tributary of such different physical characteristics that analyzing its runoff separately was deemed necessary. A sketch delineating the configuration of the sub-drainage areas, and a listing of the sub-basins showing the areas, stream course lengths and stream slopes, is shown on Sheet D-2, Appendix D.

2. Reservoir Area and Capacity

Quaddick Reservoir is the enlargement of a natural lake, but the exact amount of active storage above original lake level provided by the construction of the dam is now known. By extrapolating downward from measured areas at the normal reservoir level and above, an estimated active storage of about 2,100 acre-ft. was computed. For determining reservoir surcharge capacity, planimetered areas were measured from contours delineated on the USGS 2,000 ft. per in. quadrangle sheets. Area-capacity curves for the reservoir are shown on Figure 3, Sheet D-6. Computations are shown on Sheet D-7.

3. Outflow Discharge Capacities

For use in the flood routings of the inflows into Quaddick Reservoir, discharge curves for each spillway and for outflows over the dam and dike were computed, as shown on Figure 2, Sheet D-4, Appendix D.

4. Test Flood

Quaddick Reservoir Dam is classified as intermediate in size, with a significant hazard potential (Section 1.2). For this category, the Recommended Guidelines for Safety Inspection of Dams require that, for hydraulic evaluation, the dam adequacy be tested for 0.5 PMF.

5. Precipitation Data

Precipitation data was obtained from Hydrometeorological Report No. 33, which for the northeastern Connecticut area approximates 24 in. of 6 hour point rainfall over a 10 square mile area. This value was reduced by 9 percent to apply to a 24 square mile total area, and by an additional 17.5 percent to conform to the area fit reduction criteria.

The 6 hour rainfall was distributed into ½ hour incremental periods as suggested in COE Publication EC1110-2-1411. Infiltration losses of 1 in. during the first hour and 0.2 in. during each succeeding hour were assumed. The net rainfall excess for developing the runoff hydrographs are shown on Sheet D-8, Appendix D.

6. Drainage Basin Criteria

In order to evaluate the sub-drainage basin characteristics for the lag and transport times needed to develop the sub-basin hydrographs, stream profiles were plotted from the USGS quadrangle sheets. These profiles are shown on Figure 4, Sheet D-9. Stream lengths for each sub-basin were evaluated for time-of-concentration, lag time and average flow velocity. The resulting values are recorded on Sheets D-10 and D-11. A weighted average equivalent flow velocity within the various basins is about 0.9 ft. per sec. and transport velocities between sub-areas average about 1.3 ft. per sec.

7. Selected Unitgraph

The unitgraph used for developing the various sub-basin inflow hydrographs is the curvilinear adaptation of a triangular hydrograph, shaped as described in Design of Small Dams. These unitgraphs for the variously adopted time-to-peak values for the differing sub-basins are shown on Sheets D-12, D-13 and D-14.

8. Runoff Hydrographs and Flood Routings

Runoff hydrographs were prepared for each of the sub-areas selected and combined to form the inflow hydrograph to Quaddick Reservoir. Sub-basin hydrograph printouts prepared by the HEC-1 computer program are shown on Sheets D-15 to D-33 inclusive. The combined sub-hydrographs are plotted on Figure 5, Sheet D-34, to represent the PMF inflow hydrograph into Quaddick Reservoir. It will be noted that the peak inflow is about 30,000 cfs, compared with the range of 33,000-40,000 obtained from the NED data (Para 5.1(a)).

Flood routings were made using a 0.5 PMF test flood, and also 0.3 and 0.15 PMF inflows. These routings are shown on Figures 6 and 7, Sheets D-35 and D-36. Results of the routings are as follows:

	FLOOD MAGNITUDE		
	[illegible]	0.3 PMF	0.15 PMF
Maximum reservoir water surface elevation	408. [illegible]	407.67	406.0
Maximum outflow			
Through spillways*	3,600 cfs	2,500 cfs	1,420 cfs
Over dike	8,200 cfs	3,520 cfs	0
Over dam	900 cfs	120 cfs	0
Total outflow	12,700 cfs	6,140 cfs	1,420 cfs
Maximum overtopping depth			
Over dike	2.76 ft.	1.67 ft.	0
Over dam	1.26 ft.	0.17 ft.	0
Total outflow volumes			
Through spillways	5,550 AF	4,475 AF	3,075 AF
Over dike	4,400 AF	1,660 AF	0
Over dam	300 AF	15 AF	0
Total volume	10,250 AF	6,150 AF	3,075 AF
Duration of overtopping			
Over dike	17 hrs.	13 hrs.	0
Over dam	7 hrs.	2.6 hrs.	0

From the above, it can be seen that for inflows in excess of about a 0.15 PMF the dike will be overtopped; and for inflows in excess of about a 0.3 PMF the dam will be overtopped. On this basis, the dike and spillways are adequate to accommodate only about 30 percent of the test flood, and the dam about 60 percent.

If the dike and adjacent areas were raised so that they would not be overtopped by the test flood, flood routings through the spillways and over the main dam would result as follows:

*Assuming stoplogs are not installed on west spillway

Flood Magnitude	Maximum Surcharge Elevation ft.	Maximum Outflow From Reservoir cfs	Max. Outflow Thru West Spillway* cfs	Max. Outflow Thru East Spillway cfs	Max. Discharge Over Dam cfs	Max. Dam Over-topping ft
0.5 PMF	410.5	9,700	2,900	2,400	4,400	3.0
0.3 PMF	408.65	4,340	1,960	1,520	860	1.15
0.2 PMF	407.0	2,050	1,260	880	0	0

Flood routings for the above are shown on Figures 6A and 7A, Sheets D-35A and 36A.

From the above, it can be seen that if the dike were raised so no outflows would spill through the saddle area for inflows up to the test flood, the spillways are adequate to accommodate only a 0.23 PMF inflow before the dam would overtop, or about 45 percent of the test flood.

f. Dam Failure Analysis

1. Spillway Adequacy

With the reservoir to the top of the dam, the right spillway can release about 1,460 cfs, with an exit velocity estimated at approximately 15 ft. per sec. The left spillway can release about 1,050 cfs, giving a unit discharge at the end of its chute of about 30 cfs per ft., with an estimated exit velocity of about 20 ft. per sec. The chutes for both spillways terminate at the very toe of the dam, and no stilling basins or other type of energy dissipating structures have been provided. From the records, it appears that any riprap placed below these spillway chutes has been washed away, presumably by relatively small spillway releases. It may therefore be anticipated that, even with heads on the crests of much less than to the top of the dam, the scouring velocities would be such that deep holes would be eroded below the spillways, threatening the integrity of the spillway chutes and adjacent downstream portions of the dam. A breach failure of the dam for floods of much less than a 0.15 PMF event thus becomes a possibility.

*Assuming stoplogs are not installed.

2. Breach Failure of Dam or Dike

A breach with the reservoir level at the top of the dam or dike would release a flood wave to the valley downstream. In either instance the "rule of thumb" criteria suggested in the NED March 1978 Guidance Report would be applicable. For a dam breach assuming a trapezoidal gap with a 50 ft. bottom width and 1.4 to 1 slopes, eroded to a 12 ft. depth measured from the top of the dam, the outflow through this gap would be approximately 5,000 cfs (see computation on Sheet D-37). The outflow through the spillways would be about 2,500 cfs (Sheet D-4), giving a total discharge of about 7,500 cfs. For a breach of the dike, with reservoir level at the top of the dike, elevation 406, and assuming the entire 190 ft. length eroded to a 5 ft. depth, the outflow would be approximately 3,600 cfs. The outflows through the spillways would be about 1,400 cfs (Sheet D-4), giving a total discharge of about 5,000 cfs.

3. Downstream Channel

The conditions in the river channel downstream from Quaddick Dam are discussed in Sections 1.2d and 3.1e. If not already washed away at spillway outflows with surcharge heads below the top of the dam, the lower dam and Quaddick Road crossing would be overtopped and washed out by a flood surge from a breach in the dam occurring with the reservoir level at the top of the dam. As noted in Section 1.2d, the valley area in the 6 mile reach below the dam is about 500 acres, which could absorb the active storage of the reservoir at a depth of 6½ ft., ignoring the outflow capacity of the narrow reach near Pineville. Delineated on Figure 9, Sheet D-38 (Quad sheet graphic), is the area which could be flooded by a breach failure of the dam or the dike, assuming no inflow at the time of the breach.

It may be noted that, should the breach occur when the reservoir level reached the top of the dam during the test flood, the total inflow of about 10,000 acre-ft. would be added to the estimated 2,100 acre-ft. of active storage in the reservoir. A total of about 12,100 acre-ft. would therefore pass down river in the event of a breach, all in a period of about 12 hours. If most of the 12,100 acre-ft. outflow from Quaddick Reservoir was to be held back in the upstream valley, a depth of between 20 and 25 ft. of valley storage is indicated.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

Despite the minor settlement, apparently now halted, the field investigations of the earth embankment revealed no significant distress which would warrant the preparation of slope stability or structural computations based on assumed soil properties and engineering factors.

Specific items which should be corrected and/or continually observed are listed in Section 7.3.

b. Design and Construction Data

Data on design and on the engineering characteristics of the embankment material are lacking, although performance history and inspection records for some 20 years indicate that the embankment design and construction were probably satisfactory.

Sparse records indicate that some repair work was performed in 1964 and reinforcing gabions were placed in 1976.

c. Operating Records

There are no operating records of any significance to structural stability.

d. Post Construction Changes

The changes in 1964 and 1976 have not adversely affected stability or structural integrity, nor do available records indicate any other source of possible adverse effects.

e. Seismic Stability

The dam is located in Seismic Zone No. 1, and, as indicated by the Phase I guidelines, does not warrant seismic analyses.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

On the basis of the Phase I visual examination, Quaddick Reservoir Dam appears to be in generally fair condition and functioning adequately. The deficiencies revealed, however, indicate that further investigations should be carried out and that some remedial work is needed.

The combined capacity of the two spillways is inadequate to pass the 0.5 PMF test flood outflow of 9,700 cfs without overtopping the dam and dike. The test flood would overtop the dam by about 1.26 ft. and the dike by about 2.76 ft.. The spillways are adequate to pass about 30 percent of the test flood without overtopping the dam, provided that the west spillway stoplogs are not installed.

The side walls of the west spillway appear to have been overtopped at times, resulting in erosion of the embankment. Backfill has settled adjacent to the left spillway side walls. Riprap protection immediately downstream from both spillway chutes is inadequate and much of it appears to have been washed away. Some of the ashlar masonry blocks in the wall at the downstream end of the outlet pipe have been dislodged. Brush and saplings have become established downstream of the right abutment area, in the discharge channel of the left spillway, and in the riprap on the upstream slope of the embankment. The crest of the west abutment area is about 6 in. lower than that of the remainder of the dam, apparently due to erosion by vehicle tires. There is some local erosion of the upstream face, particularly in the vicinity of the gabions between the gatehouse and the right spillway. There is some seepage below the toe of the embankment in the right abutment area and through the masonry outlet wall. Rodent burrows and some local erosion were noted in the downstream slope left of the west spillway.

There is extensive brush and tree growth on the crest of the dike and on its downstream slope. A swampy area, believed to be due to seepage through the dike, was noted at the downstream toe.

b. Adequacy of Information

The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could

not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Urgency

The recommendations and remedial measures enumerated below should be implemented by the owner within one year after receipt of the Phase I Inspection Report.

d. Need for Additional Investigation

Additional investigations are required as recommended in Para. 7.2.

7.2 Recommendations

It is recommended that the State of Connecticut should make investigations and studies of the following items, and, if proved necessary, design appropriate remedial works:

a. Review flow conditions in both spillways; determine whether modifications are required to increase spillway capacity, to improve flow in the chutes, and to forestall failure from an overtopping of the side walls.

b. Determine whether stilling basins or other energy dissipating devices and channel armor should be provided downstream from the spillway chutes and outlet pipe.

c. Review the use of stoplogs on the right spillway crest; determine whether it is feasible to abandon their use and to remove the stoplog supporting piers in order to increase the capacity of the spillway.

d. Determine whether the crest of the dike should be raised.

7.3 Remedial Measures

a. Operating and Maintenance Procedures

1. Replace displaced riprap downstream of both spillway chutes for a distance of about 20 ft. with more massive stone (at least 500 lbs. each), pending the results of the investigations recommended in Para. 7.2.

2. Repair masonry wall at end of outlet pipe.

3. Restore crest at west abutment area to grade; install a barricade to prevent access by vehicles.

4. Restore eroded earth above gabions on upstream slope and on downstream slope left of right spillway. Restore settlement of backfill and/or erosion adjacent to side walls of both spillways.

5. Eliminate rodent burrows on downstream slope left of right spillway; monitor embankment for further infestations.

6. Monitor seepage issuing from an area 10 ft. downstream from the right embankment, and leakage through the masonry outlet wall, for adverse changes in volume and turbidity. This should be carried out monthly during periods of high reservoir level and at least twice a year.

7. Remove brush and saplings from the area downstream of the right embankment, from the discharge channel of the left spillway, and from the riprapped part of the upstream slope.

8. Develop a formal surveillance and flood warning plan, with an operational procedure to be followed in the event of an emergency.

9. Institute procedures for an annual periodic technical inspection of the dam and its appurtenant works.

10. Repair cracking and spalling of upstream and downstream retaining walls of east spillway.

7.4 Alternatives

Appropriate alternatives to these recommendations appear to be: 1) raising the level of the dam and dike to provide more surcharge storage; 2) increasing the spillway capacity; 3) a combination of (1) and (2) above; and 4) maintaining the reservoir at a lower pool elevation.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

Identification No. CT 00184 | Name of Dam: Quaddick Reservoir Dam | Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
EMBANKMENT - DAM Vertical alignment and movement	Alignment good. Early settlement of embankment evident, now halted. West end of dam is low, below general crest elevation by 6 in.±
Horizontal alignment and movement	Alignment good, no movement observed.
Unusual movement or cracking at or near the toe	None observed.
Surface cracks	None observed.
Animal burrows and tree growth	Rodent burrows, top of downstream wall, center of embankment. Growth invading upstream riprap. Heavy growth downstream, right embankment.
Sloughing or erosion of slopes	Minor sloughing, upstream face left of right spillway, over gabions.
Riprap slope protection	Ravelling, right side of right spillway. Riprap undersized.

VISUAL INSPECTION CHECKLIST

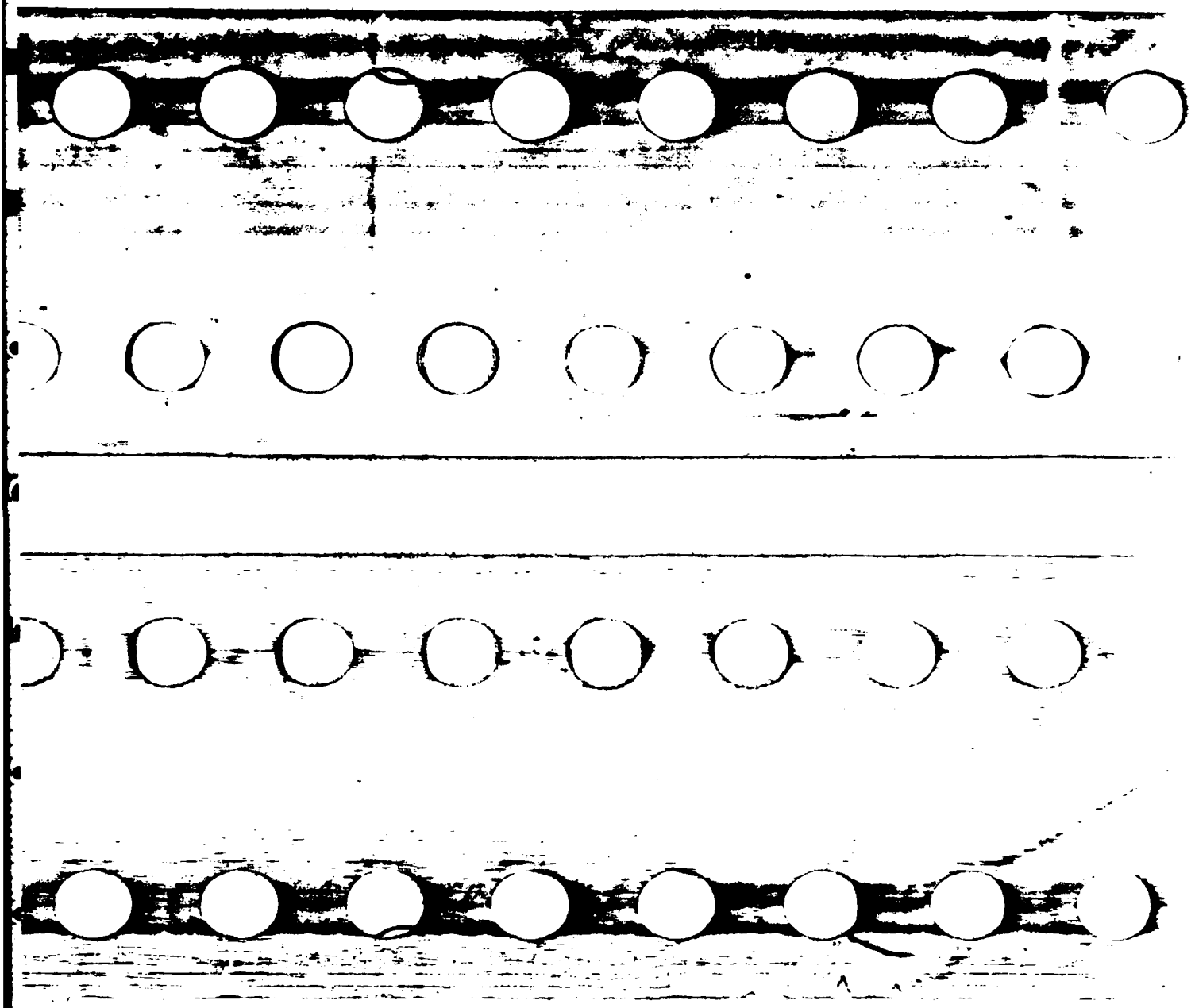
Identification No. CT 00184 | Name of Dam: Quaddick Reservoir Dam | Sheet 2

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
Seepage	Seepage channel, 0.1 gpm, 10 ft. d/s from toe, 10 ft. right of right spillway. Operator reported seepage under left d/s outlet headwall on drawdown.
Piping or boils	None.
Junction of embankment and abutment, spillway and dam	Sloughing and erosion at right spillway walls; settlement or erosion at left spillway walls.
Foundation drainage	None apparent.
EMBANKMENT - DIKE Vertical alignment and movement	Alignment good. No movement observed.
Horizontal alignment and movement	Alignment good. No movement observed.
Unusual movement or cracking at or near the toe	None observed.

VISUAL INSPECTION CHECKLIST

Identification No. CT 00184 | Name of Dam: Quaddick Reservoir Dam | Sheet 3

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
Surface cracks	None observed
Animal burrows and tree growth	Brush on crest and downstream slope. Mature trees established on crest and downstream slope.
Sloughing or erosion of slopes	None observed
Riprap slope protection	Dry masonry walls, top 2 ft. of upstream slope
Seepage	Minor seepage along downstream toe
Piping or boils	None evident
Junction of embankment and abutment, spillway and dam	Good condition
Foundation drainage	None evident



VISUAL INSPECTION CHECKLIST

Identification No. CT 00184 | Name of Dam: Quaddick Reservoir Dam | Sheet 4

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
OUTLET WORKS Approach channel	None.
Outlet conduit concrete surfaces	N/A
Intake structure	Concrete wet well with gatehouse in good condition.
Outlet structure	30 in. dia. pipe outlets thru old masonry end wall in poor condition, several blocks dislodged.
Outlet channel	Natural channel, narrow, not armored.
Drawdown facilities	30 in. dia. sluice gate.
SPILLWAY STRUCTURES Concrete weir	Left spillway - minor cracking and spalling of side walls; some tilting of left side wall. Right spillway - old masonry with concrete stoplog supports, no stoplogs in place; 3 in. water over sill.
Approach channel	None.

VISUAL INSPECTION CHECKLIST

Identification No. CT 00184 | Name of Dam: Quaddick Reservoir Dam | Sheet 5

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
Discharge channel	*Left spillway - serious washout of riprap below* concrete apron. Right spillway - riprap below chute also washed away.
Stilling basin	None.
Bridge and piers	Footbridges over both spillways show minor cracks on decks.
Control gates and operating machinery	None.
INSTRUMENTATION Headwater and tailwater gages	None.
Embankment instrumentation	None.
Other instrumentation	None.

VISUAL INSPECTION CHECKLIST

Identification No. CT 00184 Name of Dam: Quaddick Reservoir Dam Sheet 6

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
RESERVOIR Shoreline	Appear stable, gentle slopes; east side wooded, west side agricultural.
Sedimentation	None observed.
Upstream hazard areas in event of backflooding	Trailer park and recreational area beyond left abutment. Many homes on shores and islands appear to be within surcharge storage area.
Alterations to watershed affecting runoff	None noted.
DOWNSTREAM CHANNEL Constraints on operation of dam	Small dam d/s could wash out at relatively small outflows.
Valley section	Wide, marshy for about 6 miles to Pineville; many road crossings.
Slopes	Gentle, wooded/agricultural.

VISUAL INSPECTION CHECKLIST

Identification No. CT 00184 | Name of Dam: Quaddick Reservoir Dam | Sheet 7

VISUAL EXAMINATION OF	OBSERVATIONS AND REMARKS
Approx. No. of homes/population	20-30 homes, mostly along Quaddick Road immediately below dam and dike.
OPERATION & MAINTENANCE FEATURES Reservoir regulation plan, normal conditions	No formal plan. 12 in. stoplogs installed on right spillway during summer months.
Reservoir regulation plan, emergency conditions	None.
Maintenance features	Brush cutting and general housekeeping only.

APPENDIX B

PLANS & PAST INSPECTION REPORTS

BENJAMIN H. PALMER
SHEPARD B. PALMER

CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE TURNER 7-8640

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NORWICH, CONN.

November 6, 1957

State Water Resources Commission
State Office Building
Hartford (15) Connecticut

Attention: Mr. Merwin E. Hupfer, Senior Engineer

Gentlemen:-

On Monday, November 4, 1957, I made an inspection of the Dam of the Quaddick Reservoir. This dam is located about three miles Southeast of the Village of Thompson in the Town of Thompson in the Northeastern section of the State. The dam itself is a few hundred feet upstream from the black top road which leads from Thompson to Quaddick.

This dam consists of an earth embankment about 330 feet long with a maximum height of about 12 feet. The spillway section consists of an opening 43' 6" wide between stone abutment walls and the downstream section of the spillway consists of a series of large stones laid in horizontal steps. The stone walls and the stone steps are in reasonably good condition, although I would judge that the dam itself is quite old from its general appearance. There is a wooden bridge across the spillway with one pier in the center and the height from the spillway to the underside of the wooden timbers is 57".

There are four concrete piers spaced across the spillway and these piers are about 2' high, 12" wide and 54" in length. They are put there for the purpose of taking flashboards to a height of 2' and apparently the practice is to insert these boards in the summer months. The general appearance of the dam and spillway is good and I do not think that any serious maintenance problems will come up within the next few years. The wooden bridge is all right for pedestrian traffic but I doubt if it would carry much of a truck load.

There is one draw-down gate with a stone sluiceway through the dam. This gate needs some new timbers on the top of the gate and this work should be done fairly soon. The gate apparently is leaking to some extent, as some water is passing through it, although the gate appears to be closed.

In addition to the above there are two other gates located Easterly of the spillway. These gates are 4' 6" wide and 4' high. They are operated by a winch and the concrete sluiceway in which they are located is 10' wide. The gates themselves and all wooden parts of this structure are in good condition. The concrete work on the walls on either side is very poor. It looks as though either not enough cement was used or else the gravel was dirty and the cement was poor. It has spalled off in a number of places and is generally eroded and in poor condition. While this does not constitute a serious hazard, I think that it should be patched up with fresh concrete bonded to the old.

My opinion is that $1500 should be allotted for repairs to this sluiceway and repairs to the woodwork on the other gate. I would think that with this improvement very little else would be necessary for sometime.

I wish to call your attention to the fact that the spillway capacity of the dam is nowhere near up to what we would consider good practice at the present time. The concrete piers and the bridge pier constitute bad hazards for floating objects, such as trees etc. and, of course, if the flashboards are put in place that would cut down the capacity again by 2 feet. I would say that if the flashboards were in place and the gates closed that the maximum capacity of the spillway would be about 688 cubic feet per second. The drainage area is 27 square miles, which gives a capacity of only about 25 cubic feet per second per square mile. If the flashboards were out and all gates open, then I would estimate that the capacity would be increased to around 60 cubic feet per second per square mile. There is, of course, a very large pond which has the effect of slowing down any floods and I assume that it is fair to say that the flashboards would be removed in time of storm but there is, of course, a possibility that they would not. The dam apparently has gone through all of our recent floods and presumably will last for a long time but the capacity of the spillway is obviously considerably lower than what it ought to be.

In conclusion I would say that I believe the dam to be in reasonably good condition with no serious amount of repair work necessary. If the State decides to take it over, it should do so with the understanding that I feel that the spillway capacity is quite low and the State would have to take their own chances on whether it is adequate. It would probably last a great many years as it is.

Very truly yours,

B. H. Palmer

BHP/ew

FORM PUR STO 201

INTERDEPARTMENT MAIL

DATE: March 14, 1963

TO: Memorandum to File — DEPARTMENT:

FROM: Charles J. Pelletier — DEPARTMENT:

SUBJECT: (1) ~~Dam north of old Cluett Peabody Mill~~

(2) Dam at Quaddick Reservoir - Town of Thompson

~~Item (1) Cluett Peabody Dam~~ (North Grosvenor Dale Dam)

This dam was inspected in 1957 in the course of our general survey of dams. A copy of the report is attached.

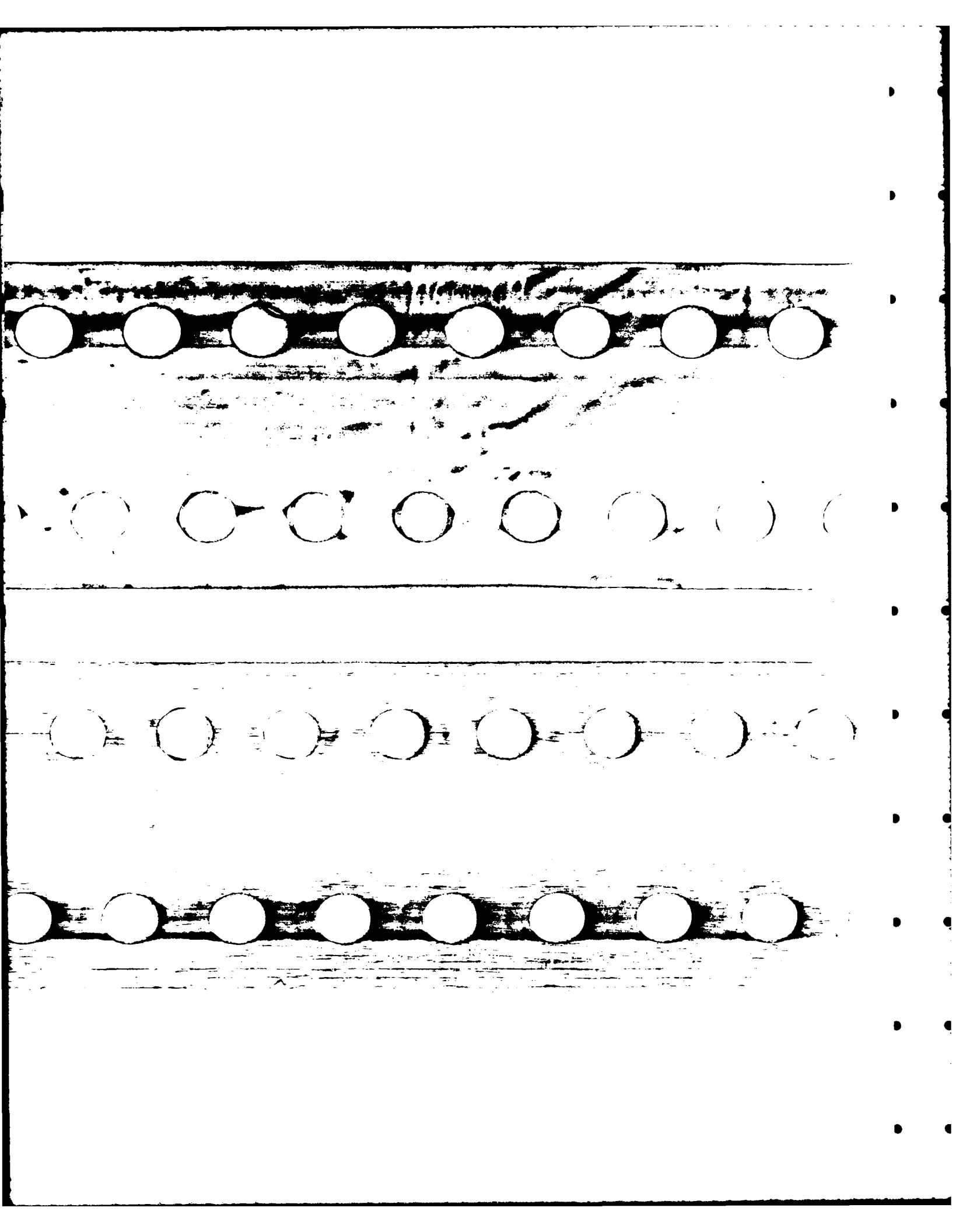
The dam is formed by two stone block overflow spillways each about 100 feet long and 16 feet high with 2 feet of flashboards and 2 feet of freeboard above the flashboards. An earth section extends upstream on the left bank parallel to the railroad. This earth section was washed out during the August 1955 flood. An earth dike forming a side hill canal on the right bank extend 0.35 miles downstream to the former Cluett Peabody Mill.

The dam and canal dike were inspected on March 13, 1963 for evidence of instability. Surficial inspection revealed no evidence that the dam or dike was in eminent danger of failure. However, leakage at two points at the bottom of the wall along the toe of the canal dike was observed. One leak is about 250 feet south of the spillway and was flowing at an estimated rate of 0.5 to 1.0 cfs. The other leak is about 200 feet north of the street which crosses the canal and was flowing at a lesser rate. Some of this leakage flow may be coming from melting of snow and frost on the dike embankment rather than through the dike. It was also noted that there are numerous trees growing on the earth sections of the dam and the canal dike.

The leakage should be checked periodically and the rate of ~~flow~~ measured ~~so that any increase will immediately be evident.~~

Item (2) Quaddick Reservoir Dam

This dam was inspected in 1957 in the course of our general survey of dams. A copy of the report is attached. A survey and report on this dam has also been made by Chandler & Palmer, Civil Engineers, for the State Public Works Department who are planning repairs for the Board of Fisheries and Game.



The dam was reportedly built to raise the water level of a natural pond and consists of a stone block spillway about 47 feet long and about 700 feet of earth dam. The spillway is about 10 feet high and the earth dam about 14 feet high. There are two conduits through the dam, one on each side of the spillway and about 15 feet from the ends of the spillway. Insofar as can be determined by surficial inspection, both conduits are formed of stone masonry. The smaller conduit, about 1.5 x 2 feet is to the west of the spillway. The gate arrangement was not evident possibly being hidden by drifted snow. The larger conduit, east of the spillway appeared to have a substantial, operable gate structure. About 140 feet east of the spillway there is a 10 foot wide by 7.5 foot deep concrete sluiceway with 2 sluice gates at the lake end of the sluiceway. There are concrete piers on the spillway with slots for stoplogs about 2 feet high. Some distance to the east of the dam there is an earth dike about 150 feet long having a maximum height of about 6 feet.

The dam and dike were inspected on March 13, 1963 for evidence of instability. Surficial inspection revealed no evidence that the dam or dike was in eminent danger of failure. However, there was a small flow from the masonry conduit west of the spillway and a small seepage flow at the toe of the earth dam 20 to 25 feet easterly from the spillway. This seepage may result from melting of snow and frost on the dam itself. It was also noted that there are numerous trees up to 14 inches in diameter growing on both the dam and dike. The concrete forming the walls of the sluice are badly deteriorated.

The westerly conduit through the dam should be checked after snow and ice has melted as should the apparent seepage east of the spillway.

A general rehabilitation of this dam is desirable to insure its future safety. This apparently is being planned by the Board of Fisheries and Game. Adequacy of the plans for rehabilitation will be reviewed when the permit application is filed.

June 21, 1963

Honorable John Dempsey, Governor

William S. Wise, Director Water Resources

Inspection of Dams in the Town of Thompson

The dams in the Town of Thompson were surveyed by the Water Resources Commission about six years ago. During that survey 21 dams were inspected. It was found that 9 of these dams were not of sufficient size or in such locations that in case they failed they probably would constitute a hazard to life and property and are placed in the category requiring no further inspection. It was found that 12 of the dams are of sufficient size so that their failure might cause damage to life and property and constitute the list of structures requiring periodic inspection.

The North Grosvenordale Dam and the Quaddick Dam are included in the second category. The North Grosvenordale Dam was re-inspected by the Water Commission staff on March 13, 1963 when it was found that no serious condition existed which should cause alarm at that time. There were minor conditions which suggested future inspections and it is placed on the list for periodic inspection to determine if any increasing deterioration might indicate a condition that should receive attention. This dam will be inspected again in the near future.

The Quaddick Dam was also inspected on March 13, 1963 and found to be in need of repairs and rehabilitation. This dam has been acquired by the State Board of Fisheries and Game and this Board has requested the State Department of Public Works to investigate the cost and necessary repairs.

The remaining ten dams in the second category were found in reasonably good condition at that time and will be re-inspected as conditions and personnel permit.

Progress on the inspection of dams has been slow due to the Commission's very inadequate staff and funds. However, the activities under this function are being accelerated so that much greater progress is contemplated and we will be in a position to handle requests and abnormal conditions much more expeditiously.

Director

WSW:js

) 4 PUR STO 201

INTERDEPARTMENT MAIL

DATE June 25, 1963

lemorandum to File	DEPARTMENT
Charles J. Pelletier	DEPARTMENT Water Resources

Dams in Thompson

Quaddick Reservoir Dam

The condition of this dam is substantially as reported in my memo of March 14, 1963 except that the flow from the old conduit westerly of the spillway appears to be somewhat greater than previously observed. The gate on this conduit is not in evidence.

Since the stream flow was relatively low, the seepage about 25 feet easterly from the spillway, was more easily observed and appeared to be greater than that observed in March. This seepage flow is about 3 feet westerly from a large elm tree growing from the low toe wall along the dam and may be associated with the root system of the tree.

The Public Works Department has taken no action beyond obtaining a preliminary planning report and is awaiting authorization of the Fish and Game to proceed.

C J Pelletier

Charles J. Pelletier
Principal Hydraulic Engineer

CJP:js

ENG. NOV 5 1963

CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE 887-8640

BENJAMIN H. PALMER
SHEPARD B. PALMER

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NORWICH, CONN.

November 4, 1963

Mr. T. J. Murphy
Public Works Commissioner
State Office Building
Hartford, Connecticut

Proj # BI-BB-55

Re: Quaddick Reservoir Dam

Attention: Mr. Milton E. Case, Ass't Chief Engineer

Gentlemen:

I have inspected the Quaddick Reservoir two or three times in the last two weeks, most recently this morning. On this last visit the pond was approximately full.

There is a stone culvert on the Westerly side of the main spillway and this is about two feet wide and one and a half feet deep. The outlet end is down quite deep and there is no visible evidence of the inlet end. I presume at sometime there was a gate on that part though there is no evidence now of the intake end. There is a little water leaking through this culvert, but not a great amount. I am not concerned about any failure of the dam because of this leak. It is quite small and does not appear to cause any danger.

At the time the other repairs on the dam are made, it might be wise to dig down over this culvert and see if it could be properly blocked off with concrete. This is a difficult thing to draw up on a plan and would be difficult for a Contractor to estimate. I think it would be better if when the Contractor has his equipment there, an additional work order might be issued to do the necessary work at that time. In the meantime, there is no danger as far as the failure of the dam is concerned.

Very truly yours,

CHANDLER & PALMER

B. H. Palmer

BHP/mir

UR STO 201

INTERDEPARTMENT MAIL

DATE Nov. 5, 1963

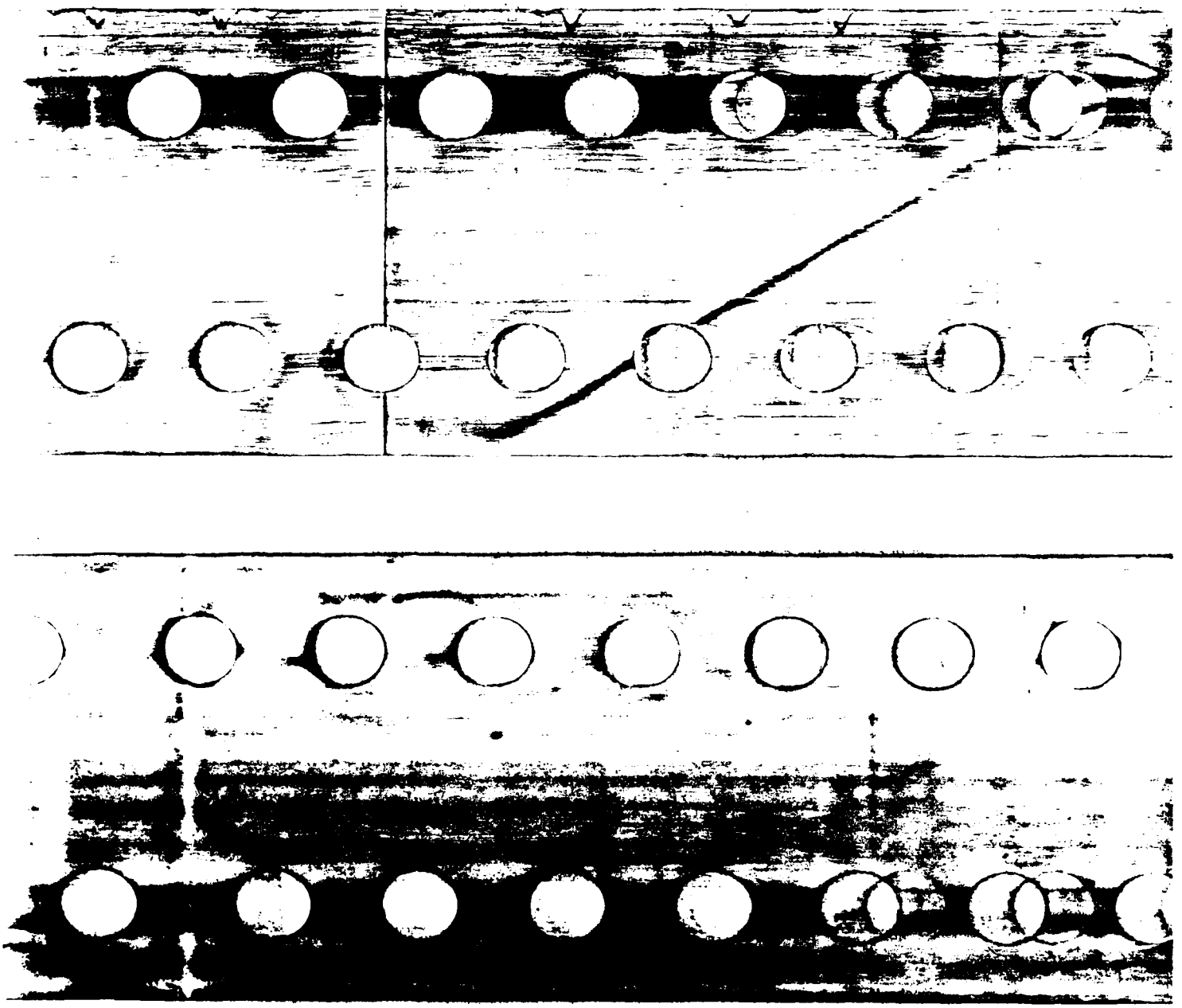
Mr. William S. Wise, Director	DEPARTMENT Water Resources Commission
T. J. Murphy, Jr., Commissioner	DEPARTMENT Public Works Department

SUBJECT Quaddick Reservoir Dam - Thompson, Connecticut. - Project BI-BB-55

We have investigated this matter and conferred with our Consulting Engineers, Chandler and Palmer. We attach their letter of November 4, 1963, which is self-explanatory. In essence our Consulting Engineers state that this dam is in no way a danger to life and limb at the present time nor in the reasonable future pending the repair contemplated. We have in our file a report from your office which indicates that the result of your investigation similarly shows no danger.

We have the final plans and specifications for this repair work in our office at this time and it is expected that contracts will be awarded within the next four to six weeks for the start of repair by Spring of 1964.

T. J. Murphy, Jr.,
Public Works Commissioner



CHANDLER & PALMER
CIVIL ENGINEERS
114-116 THAYER BUILDING
TELEPHONE 887-5640

BENJAMIN H. [illegible]MER
SHEPARD B. [illegible]KER

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SURVEYS

NORWICH, CONN.

December 2, 1963

John J. Mozzochi and Associates
Civil Engineers
217 Hebron Avenue
Glastonbury, Connecticut

Re: Quaddick Reservoir Dam
Thompson, Connecticut

Dear Sir:

I am enclosing two (2) sets of revised drawings showing proposed work at the Quaddick Reservoir Dam. Please refer to your letter to Mr. Sander dated November 6, 1963.

We have complied with your suggestions as follows:

1. We are calling for the lower steps of the stone apron to be fastened together with concrete and reinforced as shown on Section 1-1 of Sheet #2.

2. We have extended the rip rap on the upstream face of the dam to a minimum height of three (3) feet above the water level and extended it as far as it appears to be necessary.

3. We have installed six 4 inch round weep drains at six foot spacings through the downstream cut-off wall to relieve any hydrostatic pressure.

4. We have called for the drain on the West side of the main spillway to be opened up and blocked off with concrete to prevent further leakage.

If these changes meet with your approval, I suggest that you send one set of prints onto Mr. Sander marked "Approved" and keep the other set for your files.

Very truly yours,

CHANDLER & PALMER

B. H. Palmer

B. H. Palmer

BHP/nir
Enclosures
cc: Mr. William P. Sander

ADDENDA TO SPECIFICATIONS

In addition to the work previously described in the Specifications, some additional items of work have been requested in order to secure the approval of the State Water Resources Board. The items are as follows:

1. Since the lower stones on the stone spillway are somewhat loose, it has been decided to reinforce the lower two steps of the spillway. This is to be done by means of drilling into the existing stone steps and pouring a concrete slab of 3000 pounds concrete, reinforced with wire mesh in accordance with the drawings as shown. This will tie the stones together and provide a better spillway section.

2. The stone riprap on the upstream face of the dam has been increased to a height of three (3) feet above the water level and extended for some distance on either side of the spillway section.

3. Six 4 inch vitrified tile pipe weep drains are to be installed at the new spillway section to relieve any hydrostatic pressure. These are to be placed as shown with the outlet through the lower cut-off wall.

4 There is, at present, a stone culvert on the West side of the main spillway. The outlet end of the drain is clearly visible but the inlet end is covered over and is not in use. Apparently there are some leaks in this drain, since there is a small amount of water coming through the downstream end.

It has been decided to stop these leaks and the Contractor will be required to dig a hole on the surface of the dam down to and around the stone culvert. When this is opened up he shall put in a block of concrete at least 4' x 4' x 1' thick. This is to cut off the stone culvert entirely and stop any further seepage. When the work is completed, the hole shall be carefully filled in and tamped with tight material so as to replace the dam in its original condition.

RETURN TO

INTERDEPARTMENT MAIL

DATE: January 12, 1970

TO: William O'Brien III — DEPARTMENT: Water Resources Commission

FROM: Richard Hames — DEPARTMENT: Board of Fisheries and Game

SUBJECT: Quaddick Reservoir Dam Repairs

The repairs to Quaddick Reservoir Dam were completed on October 15, 1965.

Richard Hames
Fisheries Biologist

RH:ml

STATE WATER RESOURCES COMMISSION
RECEIVED
JAN 13 1970

ANSWERED _____
REFERRED _____
FILED _____

JOHN J. MOZZOCHI AND ASSOCIATES
CIVIL ENGINEERS

ASSOCIATES
JOHN LUCHS, JR.
ECTOR L. GIOVANNINI

GLASTONBURY, CONN. 06033
217 HEBRON AVENUE
PHONE 633-9401

PROVIDENCE, R. I. 02903
198 DYER STREET
PHONE 421-0420

REPLY TO: Glastonbury

March 2, 1970

STATE WATER RESOURCES COMMISSION
RECEIVED
MAR - 4 1970

ANSWERED
REFERRED
FILED

William H. O'Brien III - Civil Engineer
Water Resources Commission
State Office Building
Hartford, Connecticut 06115

Re: Quaddick Reservoir Dam
Thompson, Connecticut
Our File 57-73-61

Dear Mr. O'Brien:

The referenced site was inspected on Saturday, February 28, 1970, and the following items need attention.

1. Replace eroded riprap downstream of the cut-off wall of the new emergency spillway. Vertical face of the cut-off wall and footings of the side walls are now exposed due to the riprap being washed away. Riprap stone should be of sufficient size and placed to prevent repeated wash outs.

2. Riprap slopes immediately east and west of principal spillway to be reworked to provide protection to a height 3' above water level.

3. Remove brush and small trees (3" - 4") from embankment slopes.

These items should be corrected before a Certificate of Approval be issued.

I would further recommend that the Owner's consider placing a chain or barricade across the westerly end of the embankment to prevent vehicles from parking and turning on the embankment. This could lead to future problems.

Very truly yours,

John Luchs, Jr.

JLjr:hk

NORTH QUADDICK RESERVOIR DAM

This dam was inspected on October 15, 1973.

LOCATION - This dam is located at the south end of Quaddick Reservoir in the Quaddick section of Thompson, Connecticut, approximately 700 feet north of Quaddick Road. The Five Mile River flows through the Reservoir.

DESCRIPTION - This is an earth fill dam with two spillways and a drawdown with gatehouse. The dam, spillways and gatehouse are of recent construction. One of the spillways has provisions for weirboard installation. Basically, the entire dam is in excellent condition. The upstream bank of the dam is riprapped, however, a small section of the bank has begun to erode west of the gatehouse. The dam top is level and grassed with no repairs required. The downstream face is weeds and brush which have recently been cut. It appears that the toe of the downstream bank of the dam has a dry stone masonry enclosure. See attached sketch.

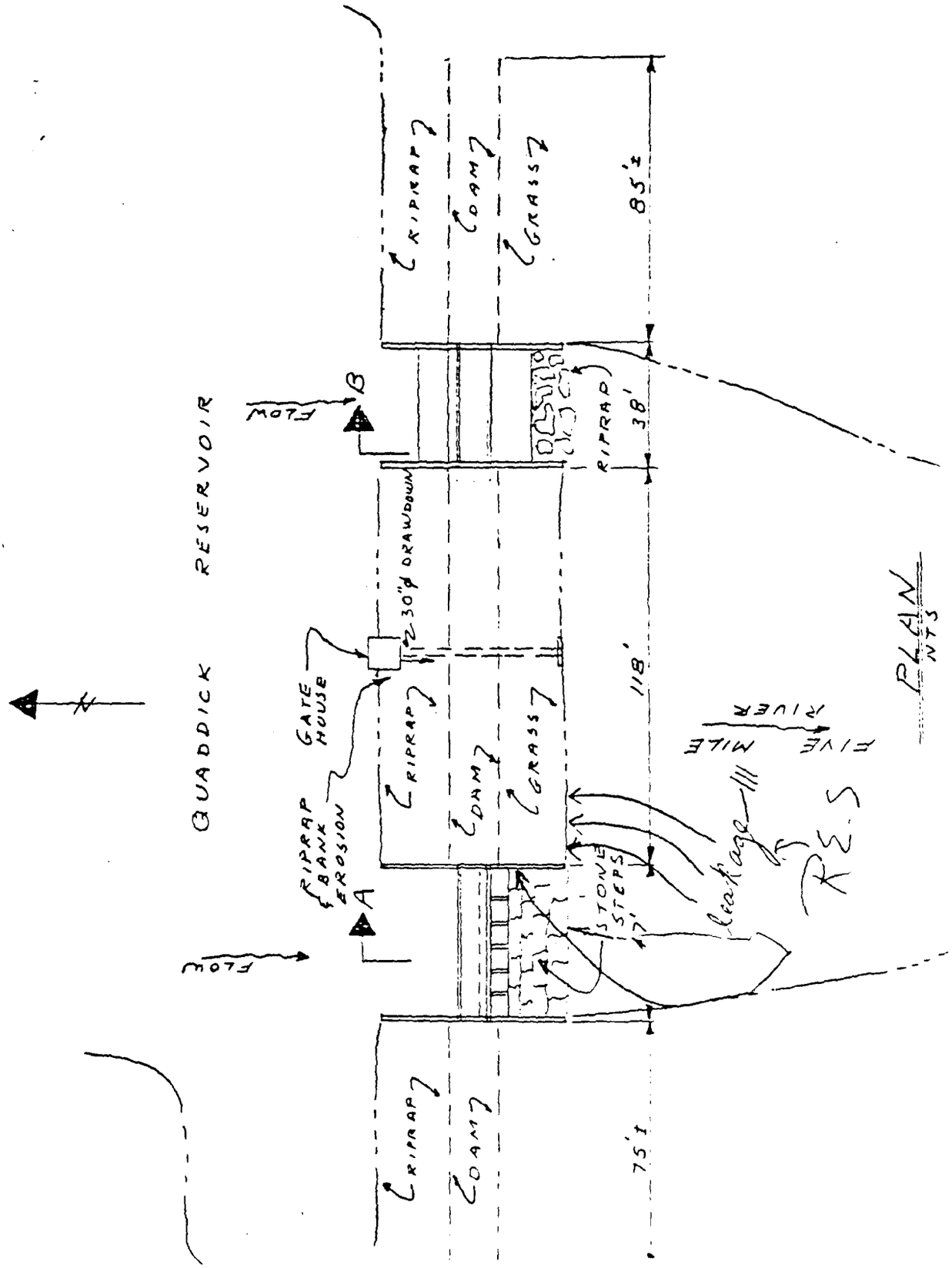
The spillways were not in operation at the time of inspection and were in excellent condition. It appears that previous flows have washed the downstream riprap away from the footings so that approximately 4 feet of concrete is exposed.

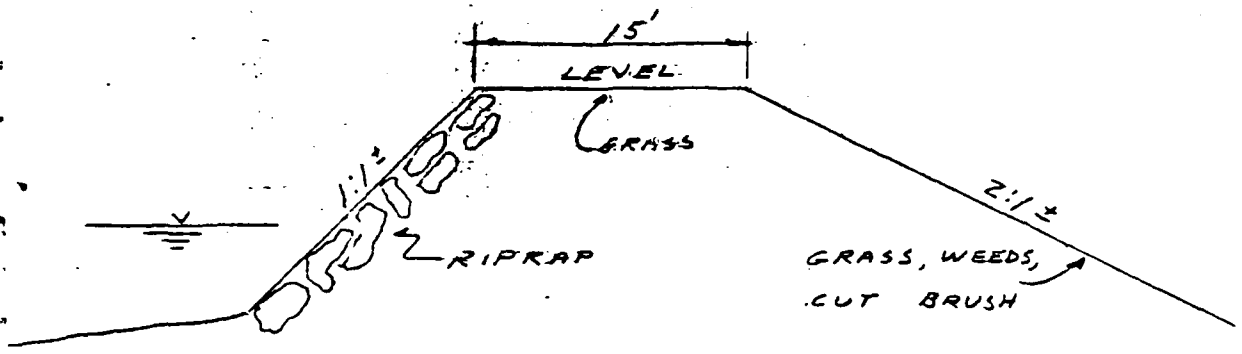
The gatehouse was locked, however, it is assumed that the control apparatus is functioning properly since the only

flow through the dam was the drawdown pipe. The east end of the dam is low, but, presents no problems since the terrain behind the dam raises rapidly and will prevent bypassing flows. The west end of the dam is slightly lower and will probably be the first point of overtopping, however, this point provides easiest access and least potential damage should a failure occur.

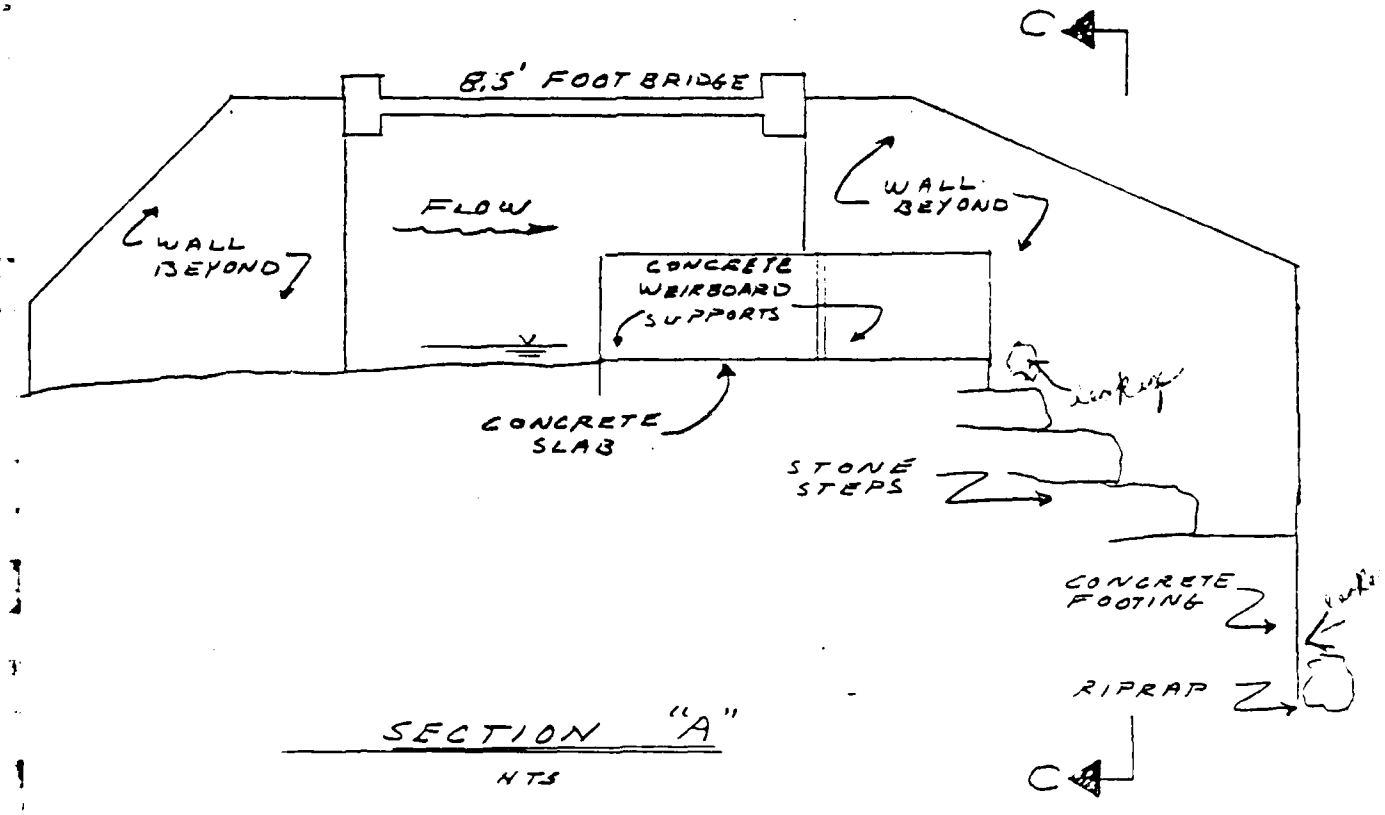
CONCLUSIONS AND RECOMMENDATIONS - It is our opinion that some additional maintenance be performed in order to prevent future problems. The area west of the gatehouse on the upstream face of the dam should receive additional riprap protection, the stumps remaining on the downstream face should be removed to prevent further growth and future problems, and heavier riprap should be placed at the spillway outlets. Also, the hydraulic condition of the dam will be improved by raising the above-described low ends of the dam.

BY PPL DATE 10-16-73 SUBJECT QUADDICK RESERVOIR SHEET NO 1 OF
CHKD. BY JHC DATE 10-17-73 QUADDICK SECTION JOB NO.
OF THOMPSON, CONN.





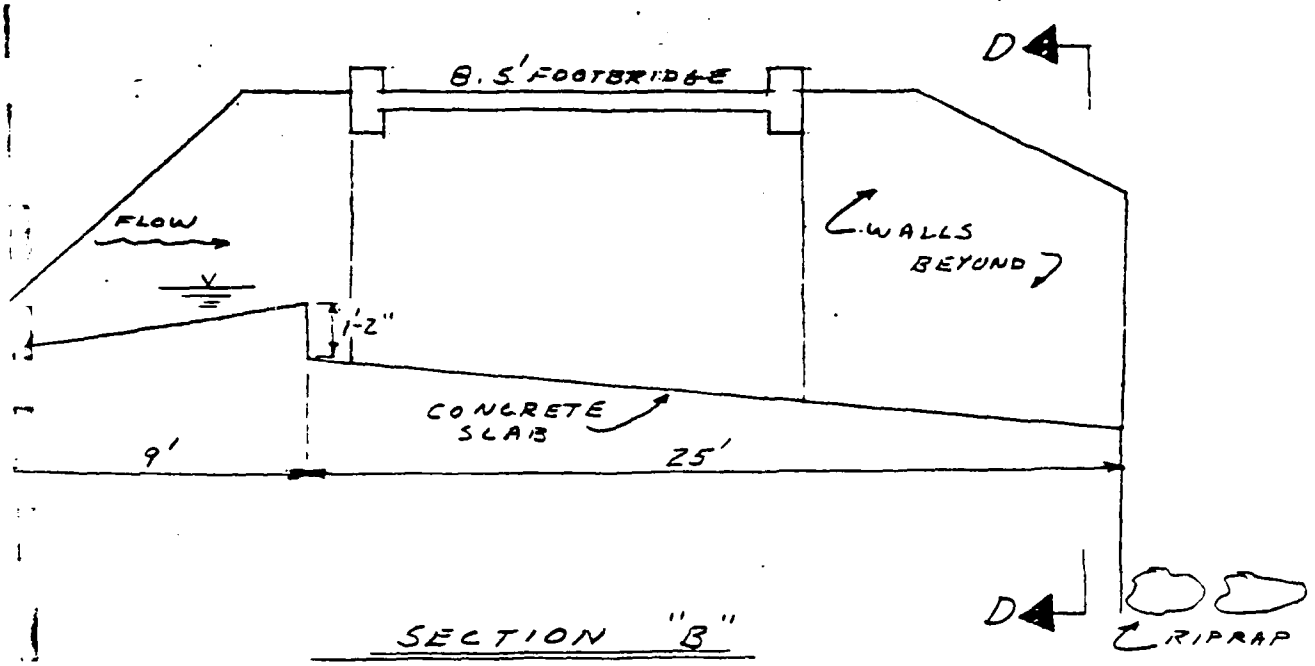
DAM SECTION
NTS



SECTION "A"
NTS

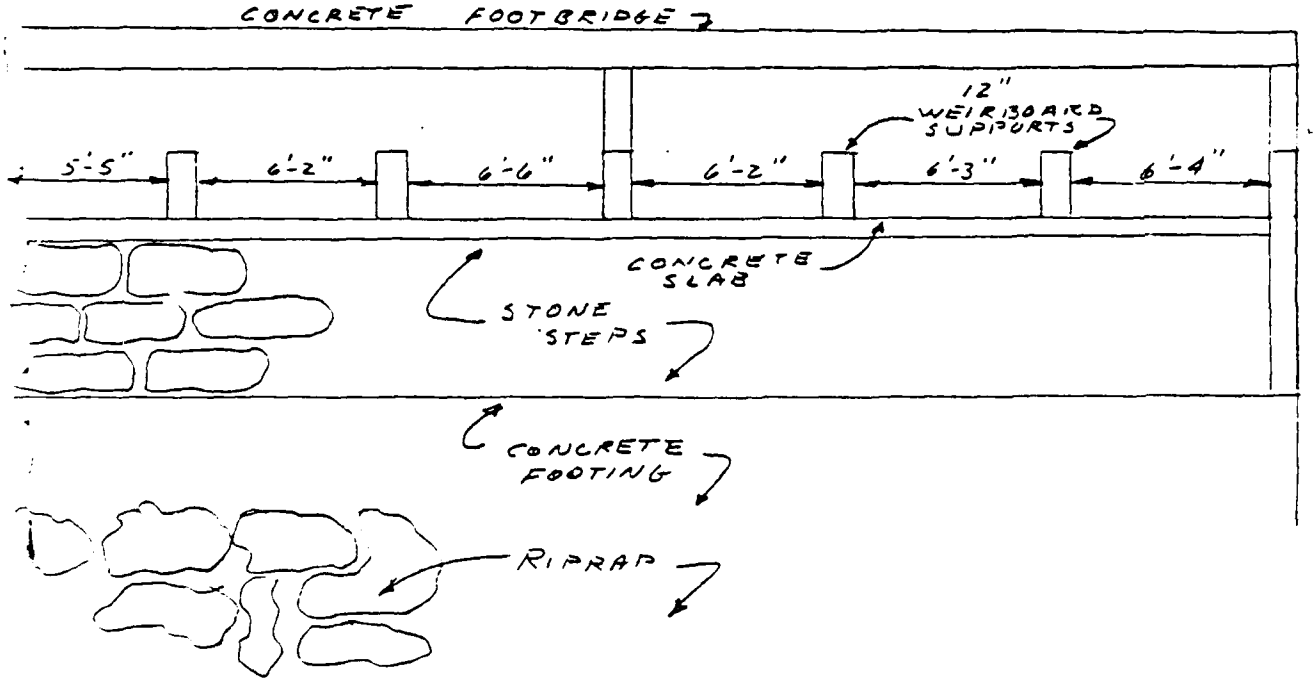
BY PPL DATE 10-16-73 SUBJECT: QUADDICK RESERVOIR SHEET NO. 3 OF 4

KD. BY JHC DATE 10-17-73 JOB NO.



SECTION "B"

NTS

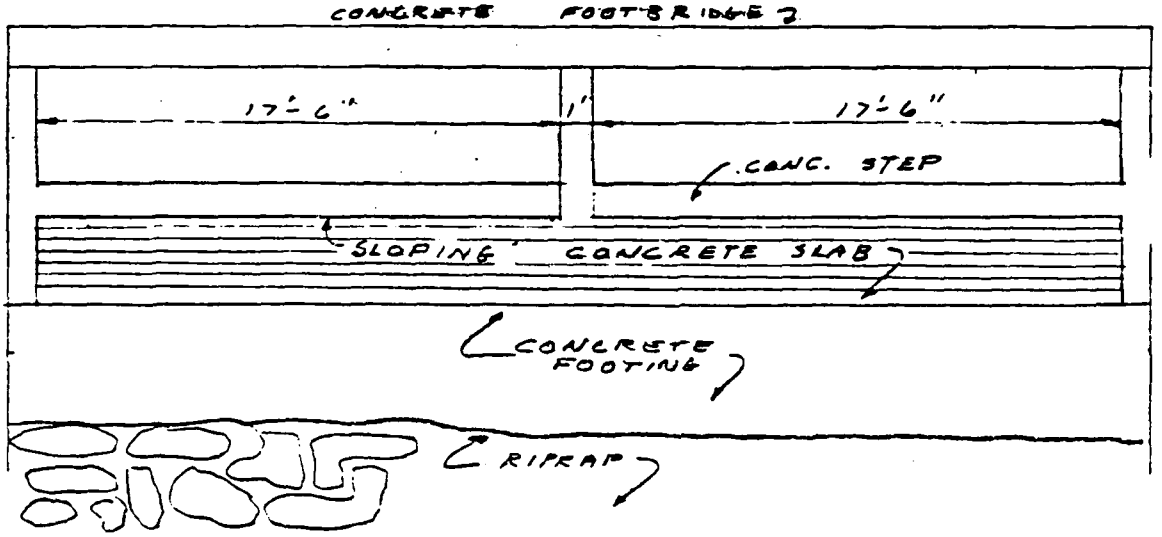


ELEVATION "C-C"

NTS

BY APL DATE 10-16-73 SUBJECT QUADDICK RESERVOIR SHEET NO. 4 OF 4

CHKD. BY JHC DATE 10-17-73 JOB NO.



ELEVATION "D-D"

NTS

SOUTH QUADDICK RESERVOIR DAM

This dam was inspected on October 15, 1973.

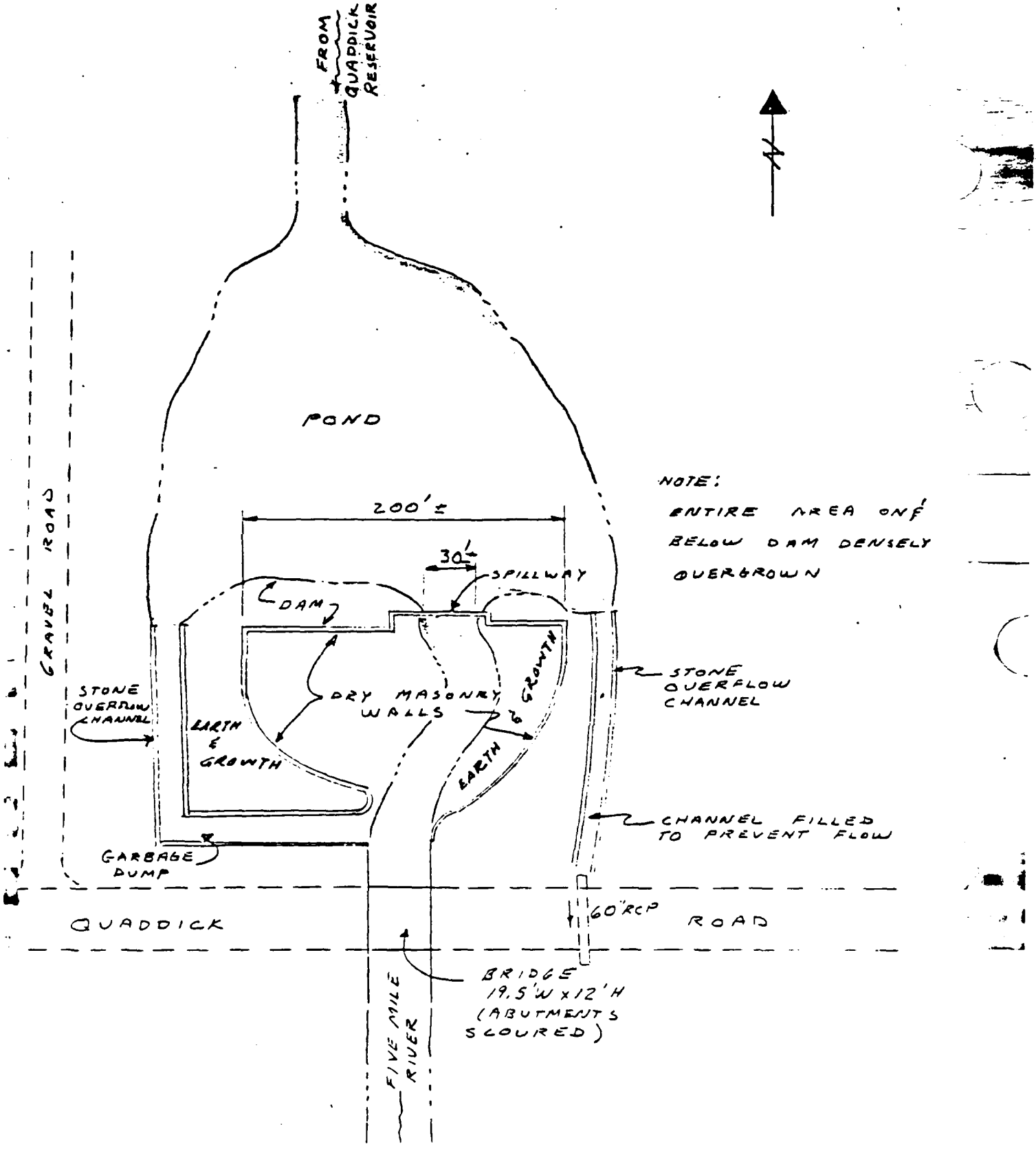
LOCATION - This dam is located approximately 500 feet downstream of the North Quaddick Reservoir Dam and is approximately 200 feet north of Quaddick Road in the Quaddick section of Thompson, Connecticut. Five Mile River flows through this pond.

DESCRIPTION - This is an earth fill dam with the downstream face being vertical dry masonry. Both ends of the dam have overflow channels. The spillway is approximately 30 feet wide consisting of a vertical dry masonry wall. Wherever there is no flow, the land is densely covered with brush, vines and trees. The two overflow channels are inoperative at this time. The west channel is filled with household garbage adjacent to Quaddick Road and was dry upstream at the time of inspection. The east overflow channel was plugged with dumped fill to prevent flow through the 60 inch R.C.P under Quaddick Road. This dam and spillway have nowhere near the capacity of the North Quaddick Reservoir facility immediately upstream. Downstream of the dam is a bridge carrying Quaddick Road over Five Mile River. The abutments and wingwalls are severely scoured at the present time. Should this dam fail, the bridge and roadway might be endangered, however, the volume of water in the pond might not be sufficient to cause failure. See attached sketch.

CONCLUSIONS AND RECOMMENDATIONS - As a minimum, the critical areas should be cleared of trees and brush and the overflow channels reopened to flow, and the footings of the downstream should be repaired and protected to prevent additional scour.

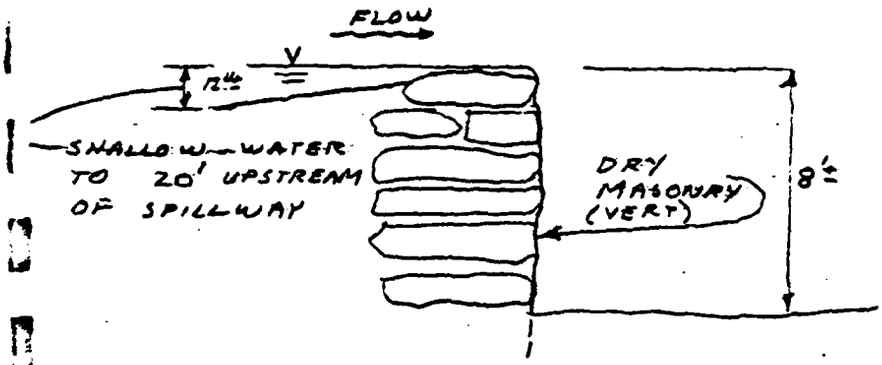
A study should be made to ascertain the necessity of this dam and its possible removal since there is a more efficient dam and spillway 500 feet upstream. If removal is not possible or desirable, this dam and spillway should receive further study to determine what effect a sudden failure would have.

BY JHC DATE 10-16 | BY DATE 10-16 | SUBJECT QUADDICK RESERVOIR POND 500 FT BELOW QUADDICK RESERVOIR | SHEET NO. 1 OF 2 | JOB NO.



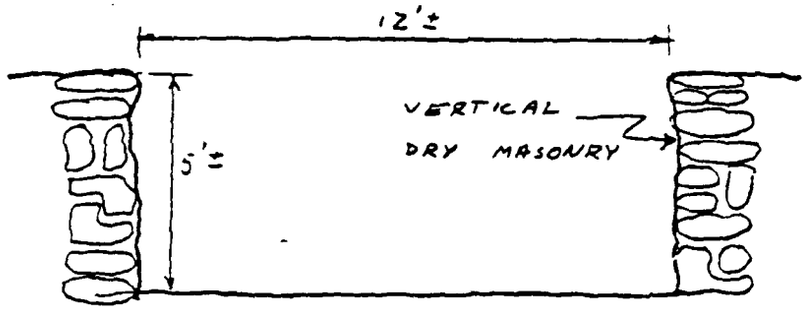
BY PPL DATE 10-16-73 SUBJECT QUADDICK RESERVOIR SHEET NO. 2 OF 2

CHKD. BY JHC DATE 10-16-73 JOB NO.



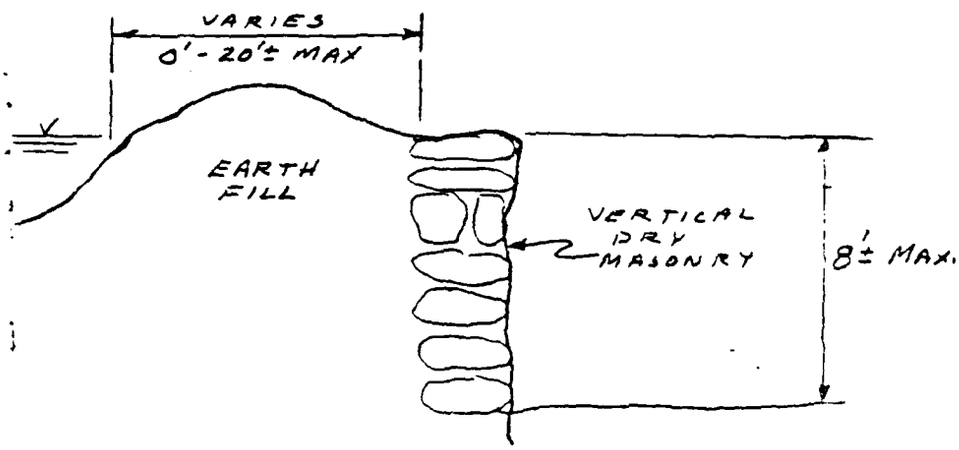
SPILLWAY SECTION

NTS



STONE OVERFLOW CHANNELS

NTS



DAM SECTION

NTS

MACCHI ENGINEERS

[illegible]ETT STREET • HARTFORD, CONN., 06105 • PHONE (203) 549-6190

[illegible]
M[illegible]HAEL GI[illegible]

ASSOCIATE CONS
PROF. C. W. D[illegible]

August 6, 1974

St[illegible]nnecticut
Depa[illegible]ent of Environmental Protection
Wate[illegible]nd Related Resources
165 Capitol Avenue
Hartford, Connecticut 06115

Attention: Mr. Victor F. Galgowsky
Superintendent of Dam Maintenance

Reference: Inspection of Quaddick Reservoir North Dam
Town of Thompson

Gentlemen:

On Tuesday, August 6, 1974 an inspection was made of this dam by Messrs. V. Galgowsky of the Department of Environmental Protection and J. Cosio of Macchi Engineers to verify present conditions of the dam.

The water level on the day of this inspection was much higher than when we inspected this dam originally on October 15, 1973. However, the findings and recommendations shown in our report dated October 18, 1973 are still valid.

The erosion west of the gate house seems to have deteriorated and should be attended to at the earliest possible time. Riprap should be placed at the downstream toe of the concrete spillways and the low ends of the dam should be filled.

A low leak next to the west spillway observed in this visit does not seem to be hazardous. A new routine inspection of this dam should be made within the next two years to observe the behavior of this leak.

WATER & RELATED RESOURCES RECEIVED
AUG 6 1974
ANSWERED
REFERRED
FILED

JHC/rma

Very truly yours,

Jose H. Cosio

MACCHI ENGINEERS
Jose H. Cosio, P.E.
Chief Engineer

WATER & RELATED RESOURCES RECEIVED
AUG 7 1974
ANSWERED
REFERRED
FILED

Les whitbeck -

roject Title QUADDICK DA

Regional Use Only

te 9/27/76

ogram

Job # Type

d. Proj. #

Related Work

Record Only

roject #

Funding Code

Funds Available

STATEMENT OF NEED, DESCRIPTION & OBJECTIVES (Needed information to be attached - should include sketches and detailed drawings.) THE QUADDICK DAM HAS BEEN AND IS CONTINUING TO BE ERRODED AWAY. THE AREA BEING DAMAGED IS APPROX 20' LONG AND PRESENTLY A 5' 2' INDENTATION EXISTS IN THIS AREA (SEE ATTACHED SKETCH) GABIONS WOULD BE USED TO REESTABLISH THE FORMER THICKNESS OF THE DAM AND PREVENT NEW EROSION

MATERIALS NEEDED (Attach itemized list giving best cost estimates, necessary specifications for contractural services, non-standard materials, suggested vendors.)

Proposed by JOHN FOLSOM Project assigned to John Folsom

Estimate of: Cost (total out of pocket) ALL MATERIALS NEEDED ARE ON HAND

Basis for estimate GABIONS, STONE, WIRE

Man hours (if done by our forces) 84 HOURS

Equipment (total hours each piece) Dept. X Contract

BY HAND, PICKUP TRUCK

Project to be accomplished by: Contract Dept. X If not feasible by contract, can it be handled by the Region? YES What quarter (s)? OCTOBER 1976

Fiscal year:

Quarters	1st	2nd	3rd	4th
Original Priority		X		
Adjusted Priority				

Basis for priority: TO BE DONE OCTOBER 1 - OCTOBER 8, 1976 TO COINCIDE WITH LOWERING OF QUADDICK LAKE WATER LEVEL

Completion date and/or estimate of time needed from starting date 10/8/76

RECEIVED

SEP 30 1976

(OVER)

REGION - REVIEW	APPROVED	COMMENTS	IS A TIME STU... DESIRED ON PROJ...
J. Olsen		this Plan been in Abeyance for Small years	

HARTFORD - REVIEW & APPROVED		
Kraska 9/30/76		CHECK W/ D. HAMES R. SONNISCHEN ? G. GALGOWSKI ALL AGREE
		IS THIS GOOD PROPOSAL (6"-8" STONE MATERIAL SHOULD BE USED WITHIN GABIONS

...erations & Maintenance _____ Date _____

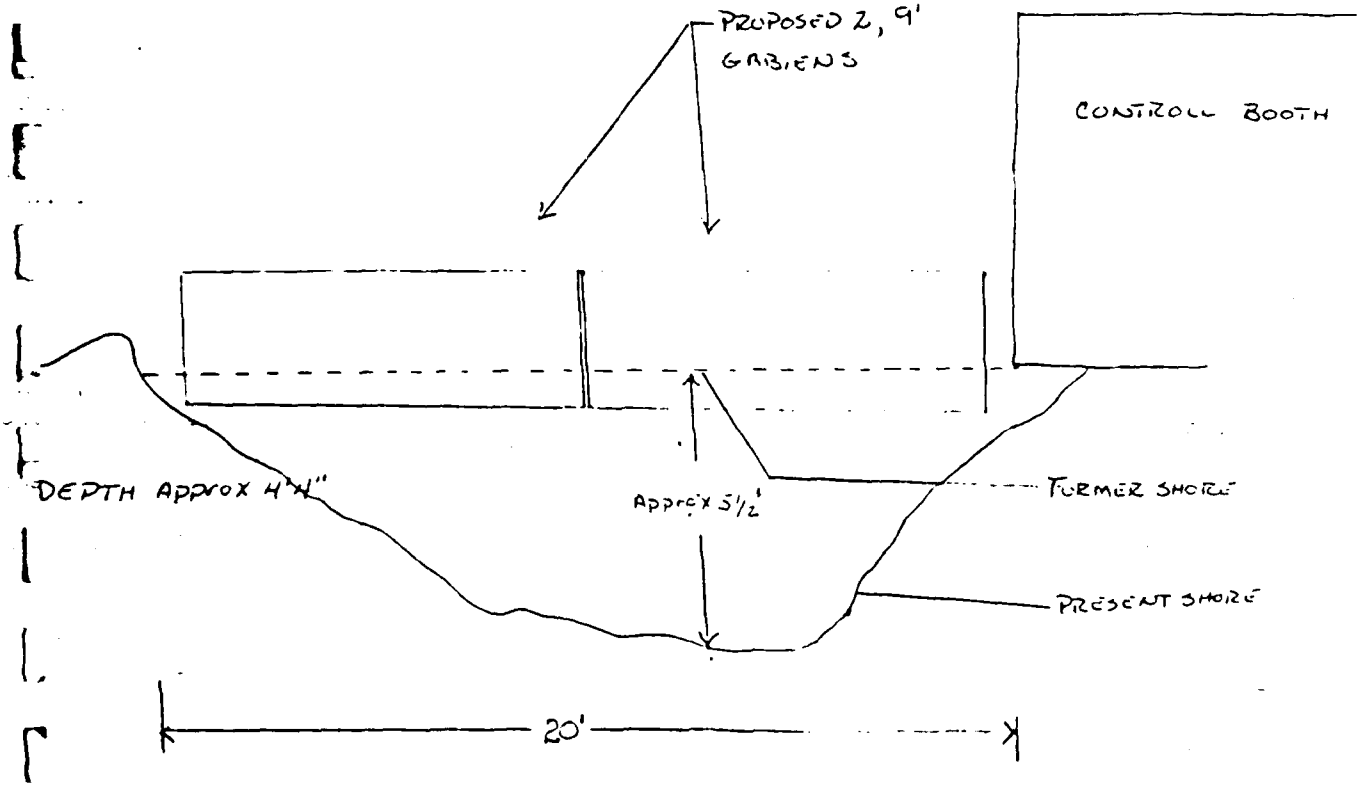
IR STO 201

INTERDEPARTMENT MAIL

DATE 8/31/76

JOHN OLSEN, DICK HARRIS	DEPARTMENT DEP REGION IV
JOHN FOLSOM	DEPARTMENT MASHPEE

ECT. QUADDICK DAM



TO REPAIR THE QUADDICK DAM I WOULD PROPOSE SETTING 2, 9' GABIENS ACROSS THE ERRODED AREA AND THEN FILL BETWEEN THE DAM AND THE GABIENS WITH ROCK AND CLAY. Approx. 10 yds OF FILL WOULD BE NEEDED AND 6 YDS OF STONE Approx. 1½' IN DIA FOR THE GABIENS. THE DAM IS ONLY 78" WIDE AT ONE POINT THUS LIMITING THE USE OF EQUIPMENT. THE LAKE SHOULD BE LOWERED TO DO THIS.

WOULD LIKE TO START THIS OCT 1, 1976.

APPENDIX C

SELECTED PHOTOGRAPHS

1. Seepage downstream of western (right) part of embankment.

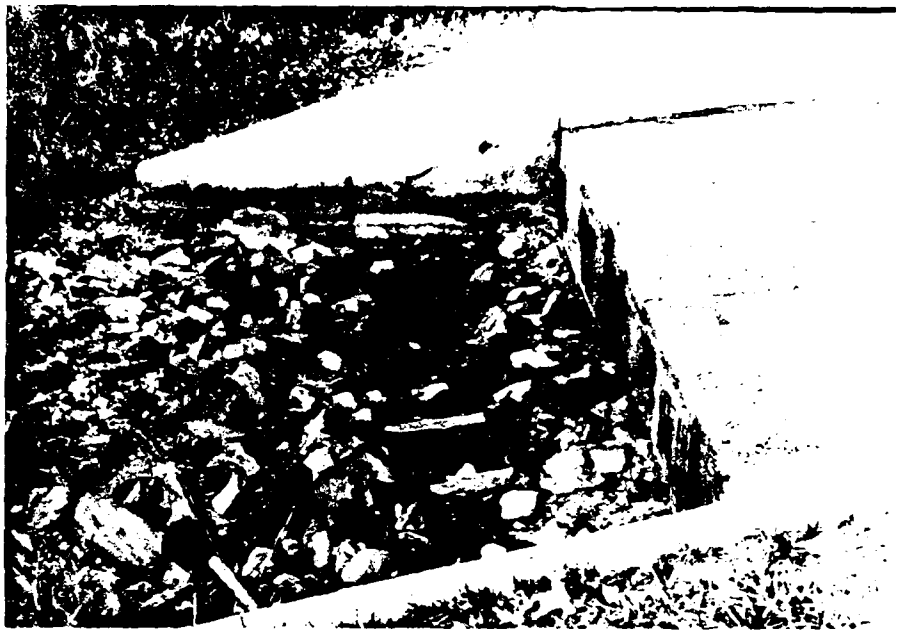
2. Downstream channel at right spillway.

3. Gatehouse and right spillway from left abutment.

4. Downstream side of right spillway.

5. Left spillway from left abutment.

6. Left spillway from downstream channel.



7. Displaced, undersized riprap in downstream channel of left spillway.

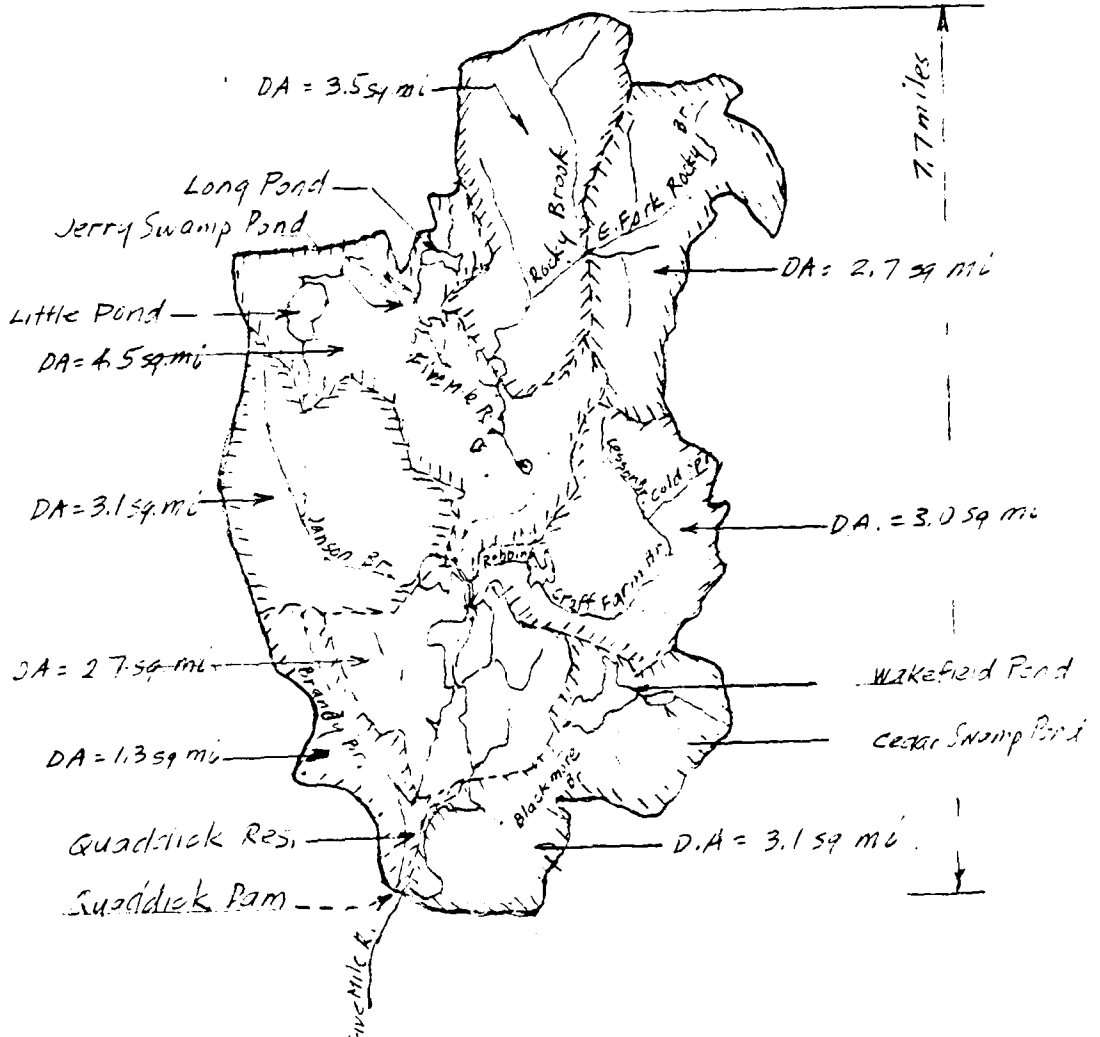
8. Dislodged rubble in dry masonry wall at downstream end of outlet culvert

9. Upstream slope of dike

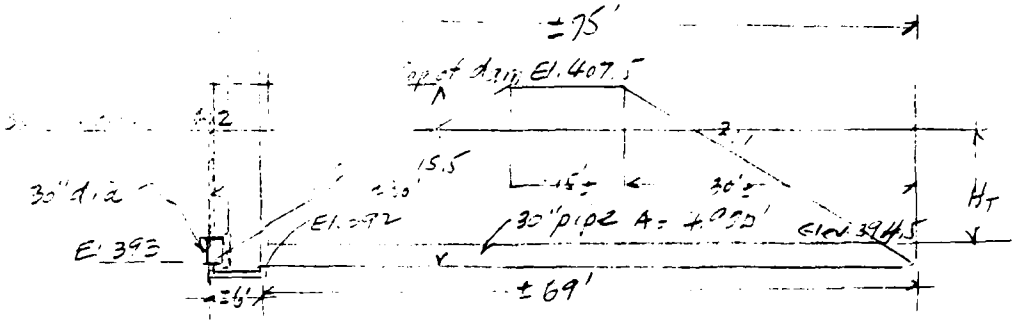
10. View along crest of dike

APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS



Drainage Sub-basin	Drainage Area Sq mi	Longest stream Course mi		Stream Slope Ft/mi
Quaddick Res	2.7	East	0.91	115
		West	1.36	38
Blackmore Br.	3.1		2.95	84
Brandy Br.	1.3		1.80	76
Crafts Farm Br.	3.0		3.67	74
Jenson Br.	3.1		3.10	57
Fivemile R.	4.5		4.11	31
Rocky Br.	3.5		3.78	77
E. Fork Rocky Br.	2.7		2.13	69



Entrance loss into well = 0.5 h_v

Entrance loss into pipe = 0.5 h_v

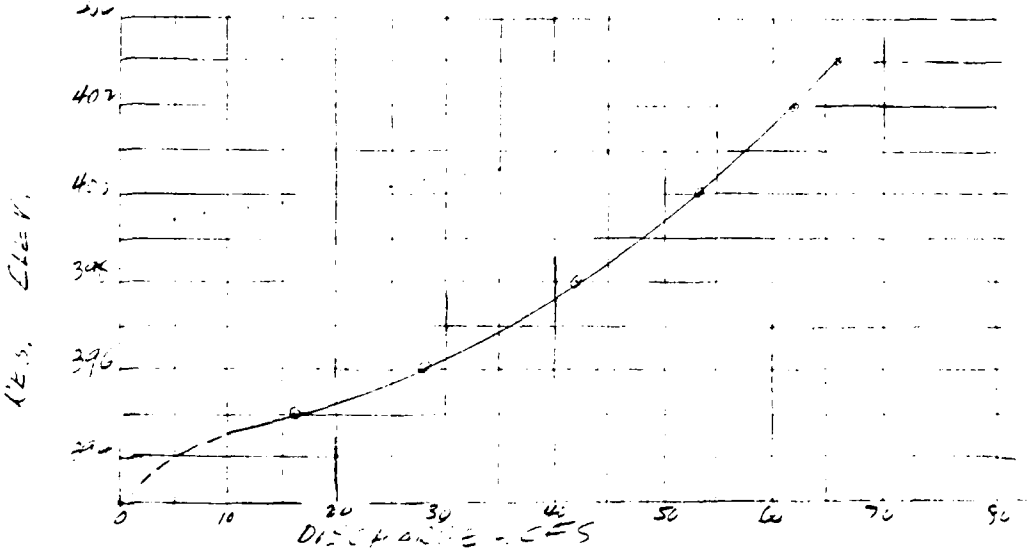
Exit loss = 1.0 h_v

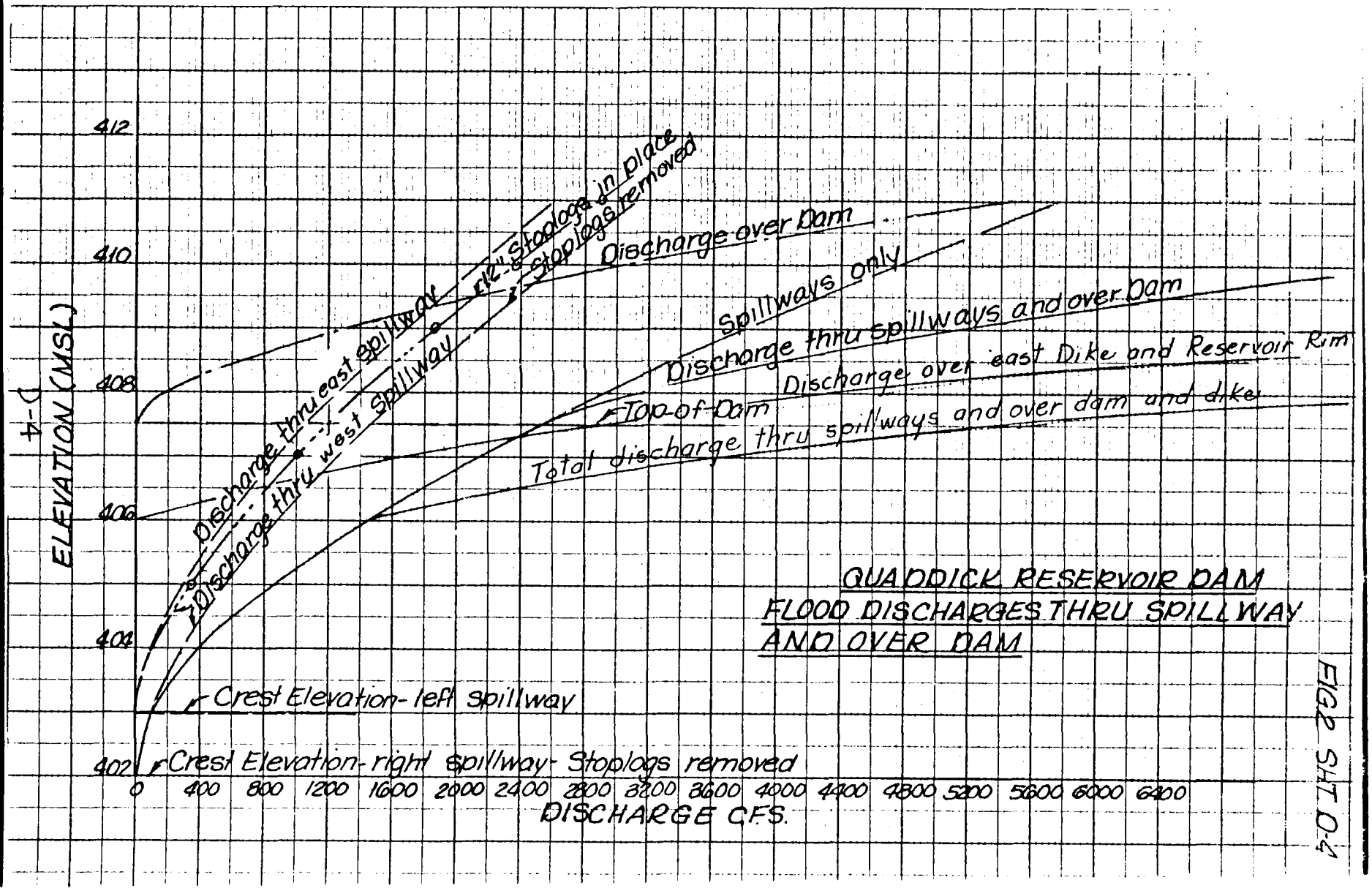
Friction loss = $\frac{fL}{D} = \frac{.03 \times 53}{5.5}$ = 0.8 h_v

ΣL = 2.8 h_v Say $k = 3$.

$Q = A\sqrt{\frac{2gH_T}{K}} = 44.1 \times 4.63\sqrt{H_T} - 22.71\sqrt{H_T}$

Elev.	H_T	Q
403	8.5	66
402	7.5	62
400	5.5	53
398	3.5	42
396	1.5	28
395	0.5	16





QUADDICK RESERVOIR DAM
FLOOD DISCHARGES THRU SPILLWAY
AND OVER DAM

FIG 2 SHT D-4

D-4

BY________ DATE________ **LOUIS BERGER & ASSOCIATES** SHEET NO. ____

CHKD. BY________ DATE________ PROJECT________

SUBJECT [illegible] RESERVOIR SPILLWAY [illegible]

Dam Elev	Lake Elev	West Spillway H	C	L	ΔQ	H	ΔQ	East Spillway L = 35' H	C	ΔQ	Dam L = 164' H	C	ΔQ	Dam L = 176 H	C	ΔQ	Dam H	q/l	Avg q/l	L	ΔQ	ΣQ
98.0	402.0	0			0																	0
99.0	403.0	1.0	2.8	35.6	100			0		0												100
100.0	404.0	2.0	2.8		282			1.0	3.0	105												387
100.33	404.33	2.33	2.8		354	0	0	1.33	3.05	164												518
101.0	405.0	3.0	3.0		555	0.67	8	2.0	3.1	307												870
102.0	406.0	4.0	3.0		854	1.67	32	3.0	3.12	567												1453
103.0	407.0	5.0	3.0		1193	2.67	64	4.0	3.14	879												2136
103.5	407.5	5.5	3.0		1371	3.17	93	4.5	3.15	1056	0		0				0					2518
103.76	407.76	5.76	3.0		1476	3.43	94	4.76	3.18	1156	0.26	2.6	63	0			.26	.34	0.17	6.5	1	2790
104.0	408.0	6.0	3.0		1569	3.67	104	5.0	3.20	1252	0.50	2.7	[illegible]	0.24	2.6	20	.50	.95	0.48	12.5	6	3128
104.04	408.04	6.04	3.0		1584	3.71	105	5.04	3.2	1275	0.54	2.7	177	0.28	2.6	25	.54	1.07	0.53	13.5	7	3194
104.3	408.3	6.3	3.0		1685	3.97	117	5.3	3.24	1354	0.8	2.75	362	0.54	2.7	70	.80	1.97	0.99	20	20	3645
104.5	408.5	6.5	3.0		1761	4.17	126	5.5	3.26	1472	1.0	2.8	515	0.74	2.75	114	1.0	2.80	1.40	25	35	[illegible]
105.0	409.0	7.0	3.0		1979	4.67	149	6.0	3.28	1680	1.5	2.8	946	1.24	2.8	251	1.5	5.14	2.57	37.5	96	[illegible]
106.0	410.0	8.0	3.0		2416	5.67	191	7.0	3.3	2134	2.5	[illegible]	2050	2.24	2.8	610	2.5	11.07	5.53	62.5	345	7805
107.0	411.0	9.0	3.0		2882	6.67	254	8.0	3.3	2613	3.5	2.8	3373	3.24	2.8	1061	3.5	18.33	9.17	87.5	802	11219

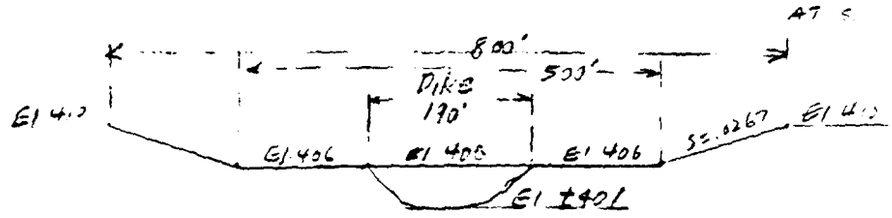
TOTAL

El	H	q/l	Avg q/l	L	ΔQ
103.76		0			0
104	0.24	0.31	0.15	3.4	1
104.3	0.54	1.07	0.54	7.7	4
104.5	0.74	1.75	0.88	10.5	9
105	1.24	[illegible]	[illegible]	17.6	34
106	2.24	9.21	[illegible]	26	121
107	[illegible]	[illegible]	[illegible]	[illegible]	234

BY_____ DATE_____ **LOUIS BERGER & ASSOCIATES INC.**

CHKD. BY_____ DATE_____ INSPECTION OF DAM - CONT. T.R.E.

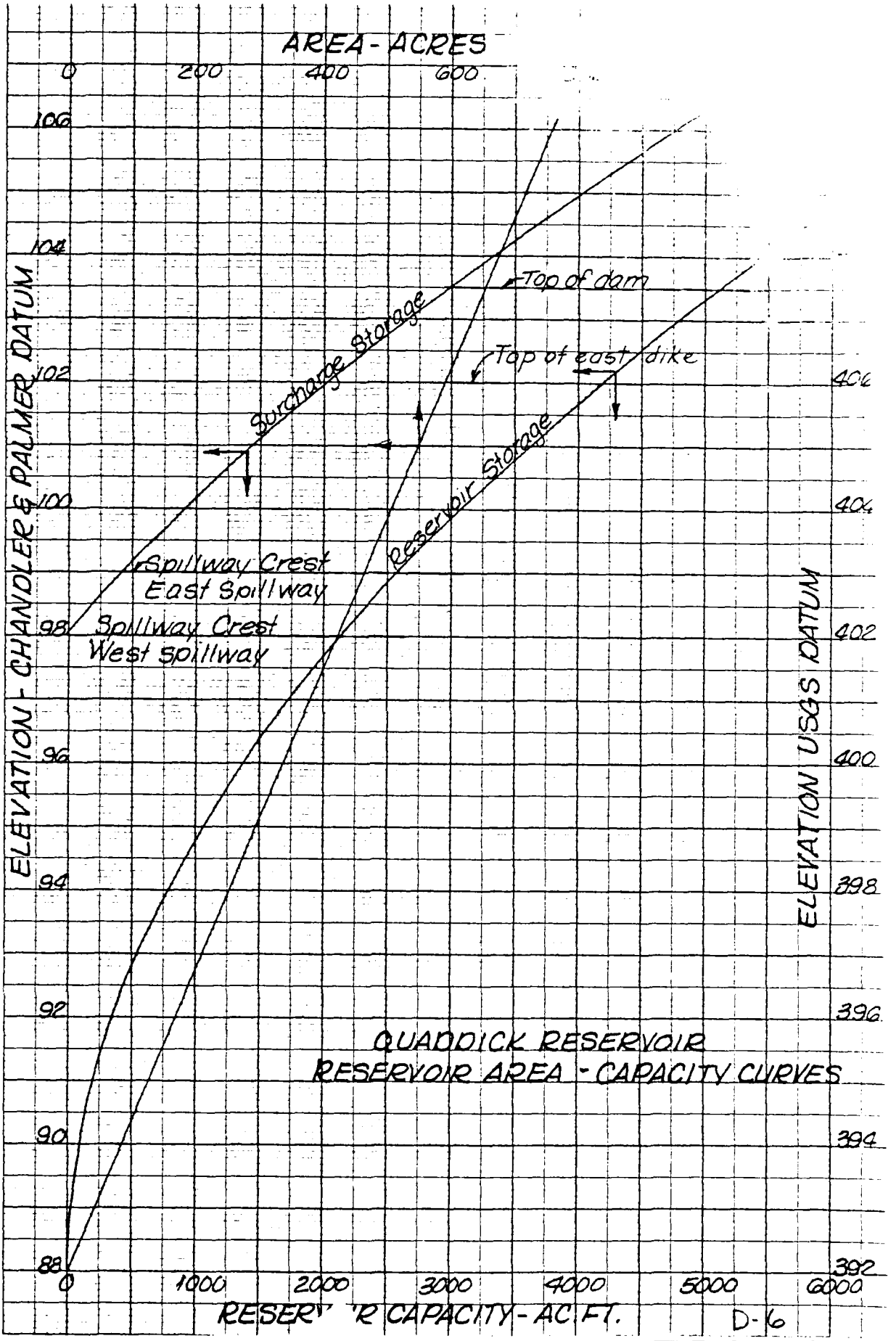
SUBJECT QUADCITY RESERVOIR - DISCHARGE OVER EAST DIKE AND



Elev. MSL	H	Q over El. 406 over 500' crest C=2.9		L Area (ft)	Q over abutments	Total Q
406	0	-				
406.5	0.5	1.03	515	0.52	37.5	20	535
407	1.0	2.90	1450	1.45	75.0	103	1553
407.5	1.5	5.33	2665	2.67	112.5	300	2965
408	2.0	8.20	4100	4.10	150.0	615	4715
408.5	2.5	11.46	5731	5.73	187.5	1074	6805
409	3.0	15.07	7535	7.53	225.0	1695	9230
409.5	3.5	18.99	9494	9.50	262.5	2490	11984

TOTAL DISCHARGE

Elev MSL	DISCHARGES WEST SPILLWAY	EAST SPILLWAY	EAST DIKE	WEST MAIN DAM	TOTAL OUTFLOW
402	0				0
403	100	0			100
404	282	105			387
404.5	354	164			518
405	563	317			880
406	826	587	0		1413
406.5	1061	717	535		2313
407	1257	879	1558		3694
407.5	1452	1056	2905	0	5413
408	1672	1252	4715	203	7843
408.5	1895	1472	6605	673	10645
409	2120	1687	8231	1327	13365



KEUFFEL & ESSER CO. STANDARD ® CROSS SECTION 10 X 10 TO THE HALF INCH

DATE 11-12-87 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. [illegible]

DATE _____ INSPECTION OF DAM - CONN. RI PROJECT _____

[illegible]OOCK RESERVOIR - CAMP, [illegible]A & DISCHARGE CURVE

RESERVOIR CAPACITY CURVE

	Area	Area	ΔVol	ΣVol	Stock Volume	USGS Map Elev
	-		0	0		
	45	22.5	23	23		
	[illegible]	67.5	67	[illegible]0		
	133	110	110	200		
[illegible]	[illegible]70	150	150	350		
[illegible]	213	191.5	192	542		
[illegible]	257	234	234	776		
[illegible]	300	278.5	277	1053		
[illegible]6	340	320	320	1373		
[illegible]	380	360	360	1733		
[illegible]	[illegible]2[illegible]	404	404	2137		402 Circle of West Side
9[illegible]	470	449	449	2586	449	403 Circle of East Side
[illegible]	[illegible]10	490	490	3,76	937	411
10[illegible]	[illegible]52	532	532	3608	1471	405
[illegible]	575	574.5	575	4183	2046	406 Top of East Dike
10[illegible]	655	615	615	4798	2661	407
[illegible]	675	665	665	5463	3316	← Top of Dam El 133 = 408.5 Mean 408
[illegible]	719	6945	697	6150	4013	409
[illegible]	760	739	739	6889	4752	410
107	802	781	781		5533	411

LOUIS BERGER & ASSOCIATES INC. SHEET NO D-8 OF ...

INSPECTION OF DAMS - CONN. P.E. PROJECT ...

RESERVOIR

	RESERVOIR SURFACE STORAGE AF	SPILLWAY DISCHARGE CFS
-	0	0
-	449	100
420	939	387
425	1471	870
430	2045	1453
437	2681	2136
442.5	2953	2515
438	3316	3125
446	4013	5142
450	4752	7565
451	5533	11219

RAINFALL DATA - 1054 mi area = 24

Reduction factor for 23.9 sq miarea: 17.5% T's of 1,000 mi for 23 sq mi = 91

Total adjusted rainfall = .91 x 1.25 = 75% x 24" = 18"

TIME HRS	Rainfall % of 6hr	Δ precip	INFILTRATION LOSS	RAINFALL EXCESS
0	-			
0.5	5.0	0.90	0.50	0.40
1.0	5.0	0.90	0.50	0.40
1.5	5.5	0.99	0.10	0.89
2.0	6.5	1.17	0.00	1.17
2.5	7.0	1.26	0.10	1.16
3.0	8.0	1.44	0.10	1.34
3.5	11.0	1.98	0.18	1.80
4.0	28.0	5.04	0.10	4.94
4.5	7.0	1.26	0.10	1.16
5.0	7.0	1.26	0.10	1.16
5.5	8.0	1.44	0.10	1.34
6.0	5.0	0.90	0.10	0.80

Log K (L × L / S^0.5)^0.38 Tp = 0.75 Log − .375D Tc = (1.67 Tp − 0.583 P)

REACH	Stor. Rout	Longest Stream Length - miles Sub	Total	Stream Slope Ft/mile Sub	Total	Lag-hrs K=.375 Sub	Total	Comp. Lag Hydrograph Tp Dischg	Adjust Tc Tp - hrs	Ave. Velocity Ft/sec	Transport from to	Ave. Miles	Ave. V Ft/sec	Time hrs
East Fork Rocky Brook D.A= 2.75 sq mi	El.600	0.7		128.6		1.05					Conf. Rocky Brook to Reser	3.3	1.6	3.0
		1.43		311		2.06	3.11	2.70						
			2.13		69.1		2.44	2.20	2.50	3.34	0.43			
Rocky Brook D.A= 3.5 sq mi	El.6	0.87		115		1.24					Confl Rocky and Five Mile to Res	1.62	1.0	
		2.14		79.4		2.37								
		0.77		26.0		1.47	5.10	4.2						
			3.78		76.7		3.50	3.0	4.0	5.85	0.95			
Five Mile Brook D.A= 4.5 sq mi	T.L. Pond Reservoir El.4	0.61		126		0.97								
		2.4		Swpt'l Lea		5.74				7.0	0.556			
		1.9		30		2.61	9.31	7.36						
			4.91		31.0		4.83	4.00	7.0	10.86	0.06			0
Simpson Brook D.A= 3.1 sq mi	Sou. Sch. 4	0.26		29		0.49								
		1.28		15.6		2.23								
		1.56		65.8		2.05	4.18	3.96						
			3.10		59.1		3.12	2.79	3.5	5.0	0.11			0
Robbins Brook D.A= 3.0 sq mi	Conn. R. Sch. 4	0.72		34.7		1.34								
		0.31		238.2		0.54								
		1.96		34.0		2.52								
			3.07		74.1		3.46	2.97	4.0	5.85	0.92			0
Rocky Point Brook D.A= 3.1 sq mi	Conn. R. Sch. 4	0.31		255.2		0.56								
		1.26		21.6		2.05								
		1.21		62.1		1.31	4.35	3.63						
			2.91		54.2		2.13	2.57	3.0	4.18	1.04			

BY ____ DA ____
CHKD. BY ____ DA ____
SUBJECT ____

J. ASSOCIATES INC.
[illegible] CONN. [illegible]

SHEET NO. ____ OF ____
PROJECT ____

LOUIS BERGER & ASS

BY ____ DATE 1-21-77

CHKD. BY ____ DATE ____

SUBJECT IN SPECTION OF DA... JUNCTION RESERVOIR - HYDROLOGY

$L_{ca} = L\left(\frac{L}{\sqrt{S}}\right)^{0.33}$ $T_p = 0.75(L + 2.75)$ $T_c = 1/0.7\,T_p - 0.83D)$

K = .64

	Str. Point	Longest Stream Length-miles Sub	Total	Stream slope Ft/mile Sub	Total	Lag-hrs K=3.75 Sub	Total	Unit graph Tp D=1.0 hr Computed	Adopted	Tc hrs	Ave. Velocity Ft/sec.	Transport time From- to	Miles	Ave V Ft/sec	hrs
Branch Brook DA - 1.3 sq mi	403	1.80	1.80		76.1		2.15	1.98	2.0	2.51	1.05				0
Southwest Side West	455	Stream 2 = 3.4													
	420	0.38		92.1		0.75			Reduced because of this direct runoff 1.50						
	403	0.98		17.3		1.84	2.59	2.30							
DA - 2.7 sq mi			1.36		38.2		2.00	1.88		4.17					
East	508														
	420	0.67		56.7		1.18									
	403	0.24		279.2		0.46	1.64	1.60							
			0.91		115.4		1.28	1.33		4.17					0
Total DA = 2.3 sq mi			24.01												

Weighted average 0.89

Longest stream 4.11 mi

Average stream length 2.73 mi

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. D-12 OF.....

SUBJECT: INSTANTANEOUS UNIT HYDROGRAPH

PROJECT.....

BLACK

T_p = 4

Time Hrs	T/T_p		Q
0.5	.167	.055	28
1.0	.333	.19	97
1.5	.50	.43	215
2.0	.667	.714	357
2.5	.833	.917	457
3.0	1.00	1.00	500
3.5	1.167	.94	470
4.0	1.333	.81	405
4.5	1.50	.68	340
5.0	1.667	.514	257
5.5	1.833	.40	202
6.0	2.00	.32	160
6.5	2.167	.253	127
7.0	2.333	.20	100
7.5	2.50	.155	78
8.0	2.667	.12	60
8.5	2.833	.094	47
9.0	3.00	.075	38
9.5	3.167	.062	31
10.0	3.333	.049	25
10.5	3.50	.036	18
11.0	3.667	.031	15
11.5	3.833	.024	12
12.0	4.00	.018	9
12.5	4.167	.012	6
13.0	4.333	.012	6
13.5	4.50	.010	5
14.0	4.67	.008	4
14.5	4.833	.006	3
15.0	5.00	.004	2

Q_p = 510.13

JANSON BROOK

T_p = 3.5 DA = 5.1

Time Hrs	T/T_p	Q/Q_p	Q
0.5	.143	.041	18
1.0	.286	.148	63
1.5	.429	.338	145
2.0	.571	.551	236
2.5	.714	.794	340
3.0	.857	.936	401
3.5	1.000	1.00	429
4.0	1.143	.954	409
4.5	1.286	.853	366
5.0	1.429	.731	313
5.5	1.571	.589	252
6.0	1.714	.479	205
6.5	1.857	.394	169
7.0	2.00	.32	137
7.5	2.143	.201	172
8.0	2.286	.215	92
8.5	2.429	.172	74
9.0	2.571	.135	58
9.5	2.714	.108	47
10.0	2.857	.082	35
10.5	3.00	.075	32
11.0	3.143	.0631	27
11.5	3.286	.0529	23
12.0	3.429	.0413	18
12.5	3.571	.0338	14
13.0	3.714	.0282	12
13.5	3.857	.0231	10
14.0	4.00	.019	8
14.5	4.143	.0152	7
15.0	4.286	.0129	6
15.5	4.429	.0106	5
16.0	4.571	.0082	4
16.5	4.714	.0059	3
17.0	4.857	.0047	2

Q_p = 428.68

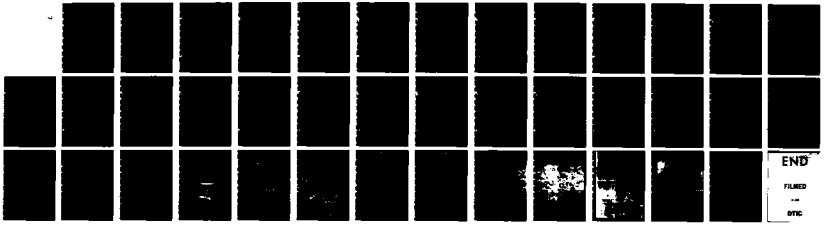
ROCKY BROOK

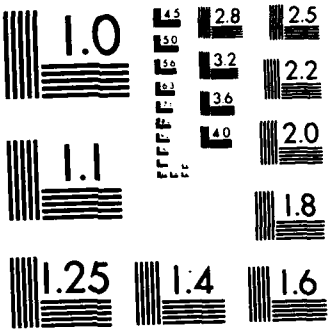
T_p = 4.0 DA = 3.5

Time Hrs	T/T_p	Q/Q_p	Q
0.5	.125	.030	13
1.0	.25	.118	50
1.5	.375	.252	106
2.0	.50	.430	181
2.5	.625	.642	272
3.0	.75	.830	351
3.5	.875	.970	409
4.0	1.00	1.00	422
4.5	1.125	.905	382
5.0	1.25	.760	321
5.5	1.375	.598	252
6.0	1.50	.450	190
6.5	1.625	.324	137
7.0	1.75	.230	97
7.5	1.875	.162	68
8.0	2.00	.120	51
8.5	2.125	.092	39
9.0	2.25	.072	30
9.5	2.375	.057	24
10.0	2.50	.047	20
10.5	2.625	.040	17
11.0	2.75	.035	15
11.5	2.875	.030	13
12.0	3.00	.025	11
12.5	3.125	.021	9
13.0	3.25	.018	8
13.5	3.375	.015	6
14.0	3.50	.012	5
14.5	3.625	.010	4
15.0	3.75	.008	3
15.5	3.875	.006	3
16.0	4.00	.005	2
16.5	4.125	.004	2
17.0	4.25	.003	1

AD-A143 454 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS QUADDICK RESERVOIR DA..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 79 2/2

UNCLASSIFIED F/G 13/13 NL





BY _____ DATE 2-1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO 2 OF _____

CHKD. BY _____ DATE _____ INSPECTION OF DAMS CONNORE PROJECT _____

SUBJECT QUADDICK DAM - HYDROLOGY

ROSS SOMERSET FARM				FIVE MILE BROOK							
T_p = 4.0 DA = 3.0			Q_p = 363	T_p = 7.0 DA = 4.5			Q_p = 311.14				Q_p = 311.14
Time Hrs	T/T_p	Q/Q_p	Q	Time Hrs	T/T_p	Q/Q_p	Q	Time Hrs	T/T_p	Q/Q_p	Q
0.5	.125	.030	11	0.5	.071	.0107	3	17.5	2.50	.155	48
1.0	.25	.118	43	1.0	.143	.041	13	18.0	2.571	.135	42
1.5	.375	.250	91	1.5	.214	.0869	27	18.5	2.643	.1231	38
2.0	.50	.430	156	2.0	.286	.148	46	19.0	2.714	.1091	34
2.5	.625	.642	233	2.5	.357	.228	71	19.5	2.786	.1052	31
3.0	.75	.832	301	3.0	.429	.328	135	20.0	2.857	.0932	29
3.5	.875	.950	345	3.5	.50	.430	134	20.5	2.929	.0842	26
4.0	1.00	1.00	363	4.0	.571	.550	171	21.0	3.00	.0752	23
4.5	1.125	.965	350	4.5	.643	.672	209	21.5	3.071	.0662	21
5.0	1.25	.880	319	5.0	.714	.794	247	22.0	3.143	.0572	18
5.5	1.375	.773	281	5.5	.786	.873	272	22.5	3.214	.0553	17
6.0	1.50	.660	240	6.0	.857	.936	291	23.0	3.286	.0523	16
6.5	1.625	.503	197	6.5	.929	.979	305	23.5	3.357	.0473	15
7.0	1.75	.455	165	7.0	1.00	1.00	311	24.0	3.429	.0416	13
7.5	1.875	.382	139	7.5	1.071	.986	307	24.5	3.50	.0360	11
8.0	2.00	.320	116	8.0	1.143	.954	297	25.0	3.571	.0337	10
8.5	2.125	.270	98	8.5	1.214	.909	283	25.5	3.643	.0304	9
9.0	2.25	.225	82	9.0	1.286	.853	265	26.0	3.714	.0272	8
9.5	2.375	.187	68	9.5	1.357	.789	245	26.5	3.786	.0257	8
10.0	2.50	.155	56	10.0	1.429	.731	227	27.0	3.857	.0241	7
10.5	2.625	.126	46	10.5	1.50	.660	205	27.5	3.929	.0206	6
11.0	2.75	.106	38	11.0	1.571	.589	183	28.0	4.00	.0171	5
11.5	2.875	.090	33	11.5	1.643	.530	165	28.5	4.071	.0157	5
12.0	3.00	.075	27	12.0	1.714	.479	149	29.0	4.143	.0150	5
12.5	3.125	.0652	24	12.5	1.786	.432	134	29.5	4.214	.0141	4
13.0	3.25	.0555	20	13.0	1.857	.394	123	30.0	4.286	.0124	4
13.5	3.375	.0467	17	13.5	1.929	.355	110	30.5	4.357	.0124	4
14.0	3.50	.0436	13	14.0	2.00	.322	100	31.0	4.429	.0113	3
14.5	3.625	.0315	11	14.5	2.071	.292	91	31.5	4.50	.0104	3
15.0	3.75	.0227	8	15.0	2.143	.261	81	32.0	4.571	.0094	3
15.5	3.875	.0221	8	15.5	2.214	.230	73	32.5	4.643	.0085	2
16.0	4.00	.018	7	16.0	2.286	.215	67	33.0	4.714	.0085	2
16.5	4.25	.0153	6	16.5	2.357	.193	60	33.5	4.786	.0085	2
17.0	4.25	.0135	5	17.0	2.429	.172	54	34.0	4.857	.0085	2

BY _____ DATE 8-1-71 | LOUIS BERGER & ASSOCIATES | SHEET NO D-4 OF ____

CHKD. BY _____ DATE _____ | INSPECTION OF DAMS: CONNECTICUT | PROJECT _____

SUBJECT QUADDICK RESERVOIR - HYDROLOGY

Quaddick Res Area

$T_p = 1.5$ D.A. = 2.7 $Q_p = 871$

Time Hrs	T/T_p	Q/Q_p	Q
0.5	.333	0.20	174
1.0	.667	.714	622
1.5	1.000	1.00	871
2.0	1.333	.81	706
2.5	1.667	.514	448
3.0	2.00	.32	279
3.5	2.333	.20	174
4.0	2.667	.12	105
4.5	3.00	.075	65
5.0	3.333	.049	43
5.5	3.667	.0296	26
6.0	4.00	.018	16
6.5	4.333	.012	10
7.0	4.667	.0073	6
7.5	5.0	.0034	3
8.0			
8.5			
9.0			
9.5			
10.0			
10.5			
11.0			

Branch Brook

$T_p = 2.0$ DA = 1.5 $Q_p = 314$

Time Hrs	T/T_p	Q/Q_p	Q
0.5	0.25	.115	36
1.0	0.50	.43	135
1.5	0.75	.84	264
2.0	1.00	1.00	315
2.5	1.25	.88	277
3.0	1.50	.65	204
3.5	1.75	.45	142
4.0	2.00	.32	101
4.5	2.25	.225	71
5.0	2.50	.153	48
5.5	2.75	.104	33
6.0	3.00	.075	24
6.5	3.25	.052	16
7.0	3.50	.035	11
7.5	3.75	.025	8
5.0	4.00	.018	6
8.5	4.25	.013	4
9.0	4.5	.009	3
9.5	4.75	.005	2
10.0	5.0	.002	1

East Fork Rocky Brook

$T_p = 2.5$ D.A. = 2.7 $Q_p = 522$

Time Hrs	T/T_p	Q/Q_p	Q
0.5	0.2	.075	39
1.0	.4	.28	146
1.5	.6	.60	314
2.0	.8	.88	460
2.5	1.0	1.00	523
3.0	1.2	.92	481
3.5	1.4	.75	392
4.0	1.6	.55	288
4.5	1.8	.42	220
5.0	2.0	.32	167
5.5	2.2	.24	125
6.0	2.4	.17	89
6.5	2.6	.13	68
7.0	2.8	.098	51
7.5	3.0	.075	39
8.0	3.2	.058	31
8.5	3.4	.044	23
9.0	3.6	.032	17
9.5	3.8	.022	12
10.0	4.0	.015	8
10.5	4.2	.010	5
11.0	4.4	.007	4
11.5	4.6	.005	3
12.0	4.8	.003	2
12.5	5.0	.002	1

QUADDICK RESERVOIR AREA
HEC-1 INPUT

SUB-AREA RUNOFF COMPUTATION

INFLOW TO QUADDICK RES AREA

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
3	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	2.70	0.0	2.70	0.0	0.0	0	0	0

PRECIP DATA

MP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.42	0.44	1.07	1.16	1.34	1.76	4.94	1.16	1.16
0.98	0.92								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
2.0	2.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

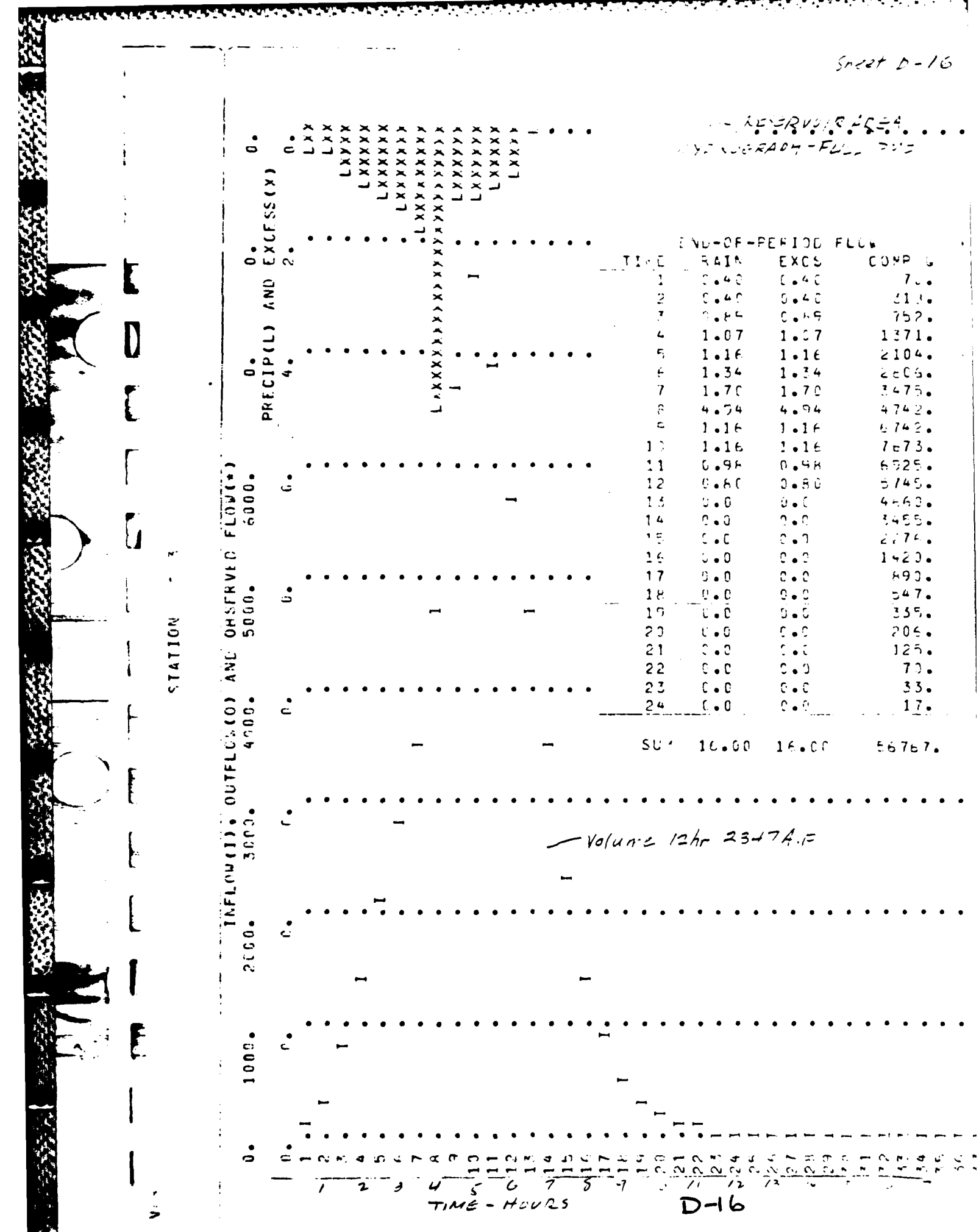
GIVEN UNIT GRAPH, NDROP= 1*

174.	822.	871.	706.	448.	279.	174.	105.	65.	43.
27.	16.	10.	6.	3.					

UNIT GRAPH TOTALS 4548. CFS OR 1.02 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00



END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.40	0.40	7.
2	0.40	0.40	21.
3	0.89	0.89	752.
4	1.07	1.07	1371.
5	1.16	1.16	2104.
6	1.34	1.34	2806.
7	1.70	1.70	3475.
8	4.94	4.94	4742.
9	1.16	1.16	6742.
10	1.16	1.16	7673.
11	0.98	0.98	6925.
12	0.80	0.80	5745.
13	0.0	0.0	4663.
14	0.0	0.0	3455.
15	0.0	0.0	2374.
16	0.0	0.0	1620.
17	0.0	0.0	890.
18	0.0	0.0	547.
19	0.0	0.0	355.
20	0.0	0.0	206.
21	0.0	0.0	125.
22	0.0	0.0	70.
23	0.0	0.0	33.
24	0.0	0.0	17.
SUM	16.00	16.00	56767.

Volume 12hr 2347 A.F

BRANDY BROOK SUB-BASIN
HEC-1 INPUTS

****

SUB-AREA RUNOFF COMPUTATION

INFLOW FROM BRANDY BROOK

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
4	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	1.30	0.0	1.00	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.55	1.07	1.16	1.34	1.70	4.94	1.16	1.16
.98	0.50								

LOSS DATA

STRKR	PTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

GIVEN UNIT GRAPH, NGRGD= 20

36.	155.	264.	315.	277.	208.	142.	101.	71.	48.
33.	24.	15.	11.	8.	6.	4.	3.	2.	1.

UNIT GRAPH TOTALS 1705. CFS OR 1.02 INCHES OVER THE AREA

RECESSION DATA

BRANDY BROOK HYDROGRAPH - FULL P

STATION - 4

PRECIP(L) AND EXCESS(X)

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

TIME	END-OF-PERIOD FLOW RAIN	EXCS	COMP
1	0.40	0.40	14.
2	0.40	0.40	68.
3	0.89	0.89	192.
4	1.07	1.07	390.
5	1.16	1.16	659.
6	1.34	1.34	962.
7	1.79	1.79	1272.
8	4.94	4.94	1705.
9	1.16	1.16	2219.
10	1.16	1.16	2743.
11	0.98	0.98	3172.
12	0.80	0.80	3004.
13	0.0	0.0	2637.
14	0.0	0.0	2174.
15	0.0	0.0	1698.
16	0.0	0.0	1244.
17	0.0	0.0	872.
18	0.0	0.0	605.
19	0.0	0.0	426.
20	0.0	0.0	294.
21	0.0	0.0	203.
22	0.0	0.0	143.
23	0.0	0.0	101.
24	0.0	0.0	69.
25	0.0	0.0	48.
26	0.0	0.0	32.
27	0.0	0.0	19.
28	0.0	0.0	11.
29	0.0	0.0	5.
30	0.0	0.0	3.
31	0.0	0.0	1.
32	0.0	0.0	0.
SUM	16.00	16.00	27282.

← Total volume 112 AF

TIME HOURS

BLACKMORE BROOK SUB-BASIN
HEC-1 INPUTS

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SUB-AREA RUNOFF COMPUTATION

INFLOW TO BLACKMORE BROOK

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
6	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	3.10	0.0	3.10	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.80	1.07	1.16	1.34	1.70	4.94	1.16	1.16
0.58	0.58								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	1.0	0.0	1.00	0.0	0.0	0.0	0.0

RIVER UNIT GRAPH, NUHOG= 40

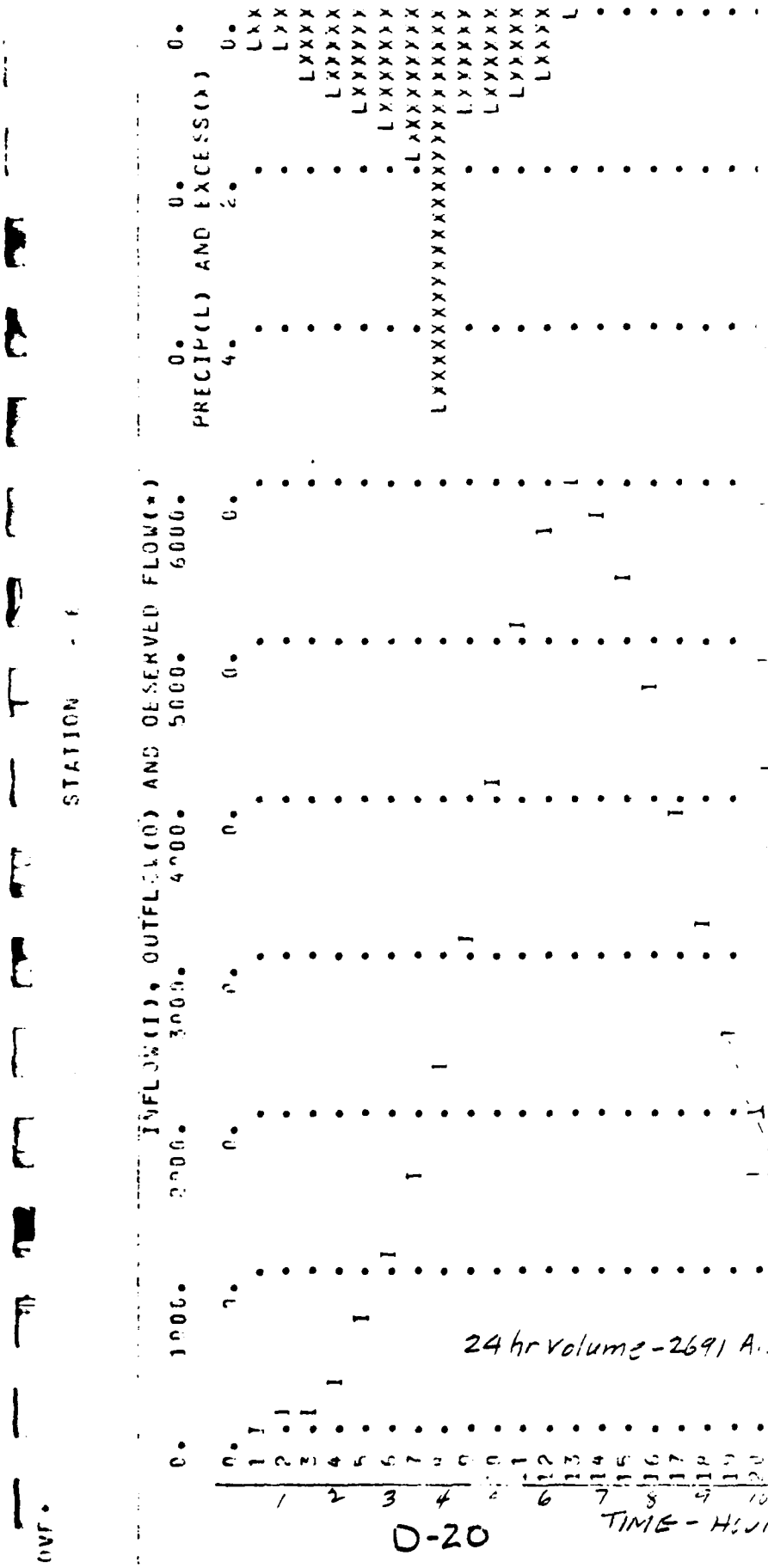
2%.	9%.	21%.	35%.	45%.	50%.	47%.	40%.	33%.	25%.
20%.	16%.	12%.	10%.	7%.	6%.	4%.	3%.	2%.	2%.
1%.	1%.	1%.	0%.	0%.	0%.	0%.	0%.	0%.	0%.

UNIT GRAPH TOTALS 4068. CFS OR 1.02 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 1.0 QRCSN= 0.0

BLACKMORE BROOK HYDROGRAPH - FULL TIME



TIME	RAIN	EXCS	END-OF-PERIOD FLOW
1	0.40	0.40	11.
2	0.40	0.40	51.
3	0.69	0.69	150.
4	1.07	1.07	345.
5	1.18	1.18	654.
6	1.34	1.34	1081.
7	1.70	1.70	1605.
8	4.94	4.94	2592.
9	1.18	1.18	3135.
10	1.18	1.18	4107.
11	0.98	0.98	5053.
12	0.80	0.80	5725.
13	0.0	0.0	5993.
14	0.0	0.0	5934.
15	0.0	0.0	5356.
16	0.0	0.0	4676.
17	0.0	0.0	3907.
18	0.0	0.0	3181.
19	0.0	0.0	2644.
20	0.0	0.0	2214.
21	0.0	0.0	1883.
22	0.0	0.0	1645.
23	0.0	0.0	1474.
24	0.0	0.0	1348.
25	0.0	0.0	1253.
26	0.0	0.0	1183.
27	0.0	0.0	1133.
28	0.0	0.0	1093.
29	0.0	0.0	1046.
30	0.0	0.0	991.
31	0.0	0.0	923.
32	0.0	0.0	839.
33	0.0	0.0	738.
34	0.0	0.0	624.
35	0.0	0.0	504.
36	0.0	0.0	387.
37	0.0	0.0	280.
38	0.0	0.0	194.
39	0.0	0.0	130.
40	0.0	0.0	84.
41	0.0	0.0	52.
42	0.0	0.0	31.
SUM	16.00	16.00	65997.

24 hr volume - 2691 A.F.

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SUB-AREA RUNOFF COMPUTATION

INFLOW TO JASON BROOK

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
7	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
3	-1	3.10	0.0	3.10	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.45	1.07	1.16	1.34	1.70	4.94	1.16	1.0
0.98	0.80								

LOSS DATA

STRKS	DLTKS	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

GIVEN UNIT GRAPH, NUPGG= 34

18.	53.	145.	236.	340.	401.	429.	403.	366.	313.
250.	204.	169.	137.	112.	92.	74.	58.	47.	39.
32.	27.	23.	19.	14.	12.	10.	8.	7.	6.
4.	4.	3.	2.						

UNIT GRAPH TOTALS 4079. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0

JANSON BROOK HYDROGRAPH - FULL PMF

STATION - 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

PRECIP(L) AND EXCESS(X)

TIME - HOURS

****

QUADDICK DAM INSPECTION #189
BY D.J.MULLIGAN
FEBRUARY 1978

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	30	0	0	0	0	200	0	0

JOPER	NWT
4	0

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SUB-AREA RUNOFF COMPUTATION

INFLOW TO ROBBINS & CROFTFARM BR

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	6	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	3.00	0.0	3.00	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.89	1.07	1.16	1.34	1.70	4.94	1.16	1.16
0.98	0.98								

LOSS DATA

STRTL	CNSTL	RTIOL	ERAIN	STRTS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

GIVEN UNIT GRAPH, NUHGG= 34

11.	43.	91.	156.	233.	301.	345.	365.	350.	[illegible]
281.	240.	197.	169.	139.	116.		82.	56.	51.
46.	37.	27.	27.	24.	20.	[illegible]	13.	12.	10.
8.	7.	6.	5.						

UNIT GRAPH TOTALS 3519. CFS OR 1.01 INCHES OVER THE AREA

RECESSION DATA

RUBBINS & CROSS FARM BROOK - [illegible]

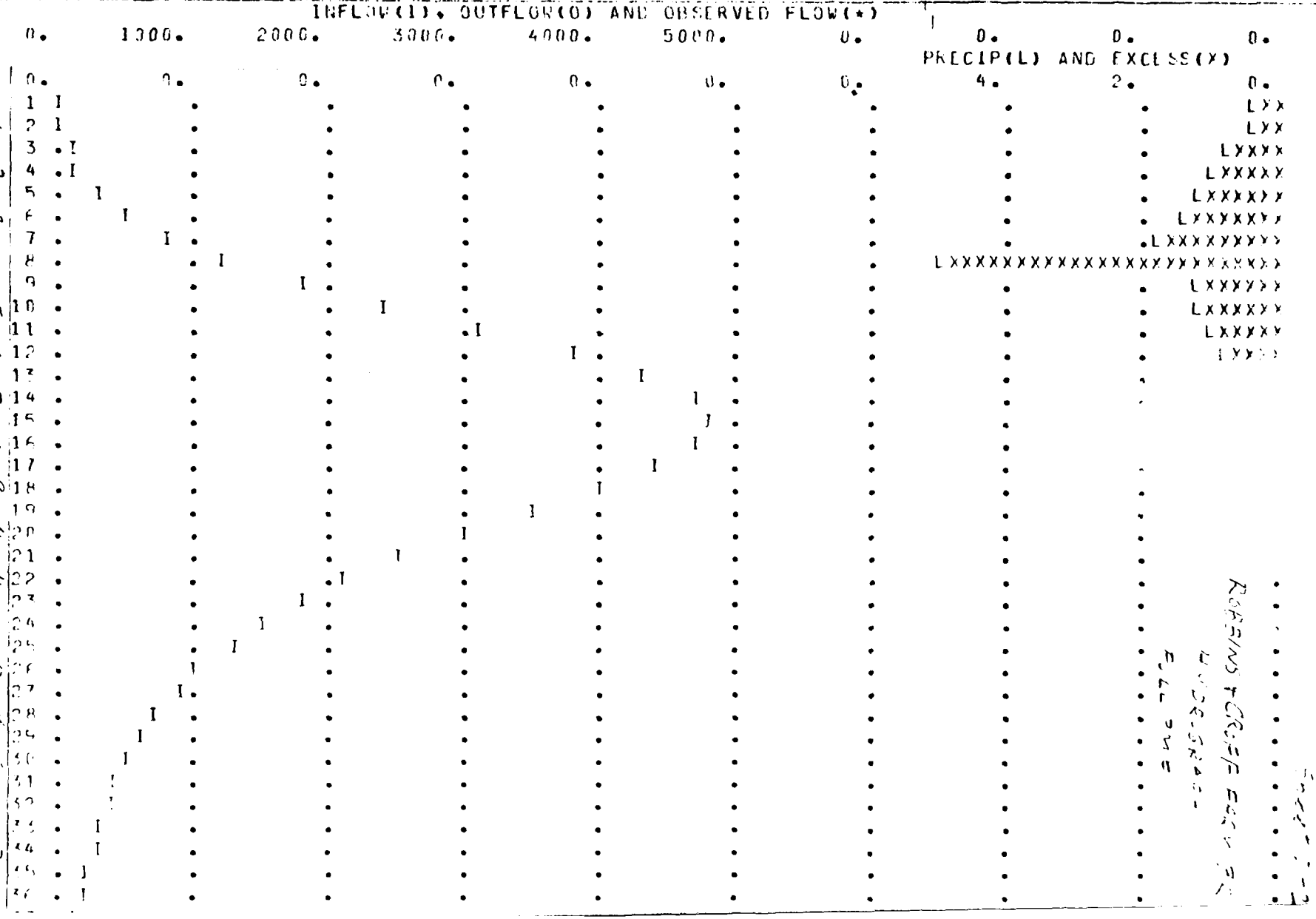
ROBBINS + CROFF FARM 3Q
HYDROGRAPH - FLOOD

TIME	END-OF-PERIOD FLOW RAIN	EXCS	COMP Q
1	0.40	0.40	4.
2	0.40	0.40	22.
3	0.69	0.69	63.
4	1.07	1.07	149.
5	1.16	1.16	295.
6	1.34	1.34	514.
7	1.70	1.70	815.
8	4.94	4.94	1231.
9	1.16	1.16	1774.
10	1.16	1.16	2393.
11	0.98	0.98	3076.
12	0.80	0.80	3750.
13	0.0	0.0	4307.
14	0.0	0.0	4665.
15	0.0	0.0	4798.
16	0.0	0.0	4689.
17	0.0	0.0	4396.
18	0.0	0.0	3983.
19	0.0	0.0	3504.
20	0.0	0.0	2999.
21	0.0	0.0	2547.
22	0.0	0.0	2146.
23	0.0	0.0	1795.
24	0.0	0.0	1502.
25	0.0	0.0	1256.
26	0.0	0.0	1047.
27	0.0	0.0	872.
28	0.0	0.0	725.
29	0.0	0.0	603.
30	0.0	0.0	503.
31	0.0	0.0	424.
32	0.0	0.0	361.
33	0.0	0.0	303.
34	0.0	0.0	256.
35	0.0	0.0	204.
36	0.0	0.0	175.
37	0.0	0.0	145.
38	0.0	0.0	114.
39	0.0	0.0	94.
40	0.0	0.0	74.
41	0.0	0.0	54.
42	0.0	0.0	28.
43	0.0	0.0	17.
44	0.0	0.0	10.
45	0.0	0.0	4.
46	0.0	0.0	0.
SUM	18.00	18.00	62706.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4798.	3769.	1306.	435.	62704.
INCHES		11.59	16.20	16.20	16.21
AC-FT		1865.	6596.	2596.	2592.

OVF

STATION 1



EAST FORK ROCKY BROOK SUB-BASIN
HEC-1 Inputs

D.26

SUB-AREA RUNOFF COMPUTATION

INFLOW TO EAST FORK ROCKY BROOK

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
5	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	2.70	0.0	2.70	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
18	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.89	1.07	1.16	1.34	1.70	4.94	1.16	1.16
0.58	0.80								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

CLARK UNIT GRAPH, NUMGG= 31

0.	0.	0.	0.	0.	0.	39.	146.	314.	465.
523.	461.	359.	293.	220.	167.	125.	94.	68.	51.
39.	31.	23.	17.	13.	9.	7.	6.	4.	3.
0.									

UNIT GRAPH TOTALS 1932. CFS OR 1.01 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

EAST FORK ROCKY BROOK HYDROGRAPH - [illegible]

STATION - [illegible]

TIME	[illegible]	[illegible]	[illegible]
1	0.40	0.40	0
2	0.40	0.40	0
3	0.69	0.69	0
4	1.07	1.07	0
5	1.16	1.16	2
6	1.34	1.34	7
7	1.70	1.70	18
8	4.94	4.94	74
9	1.16	1.16	219
10	1.16	1.16	483
11	0.98	0.98	870
12	0.90	0.90	1373
13	0.0	0.0	1934
14	0.0	0.0	2663
15	0.0	0.0	3598
16	0.0	0.0	4650
17	0.0	0.0	5483
18	0.0	0.0	5819
19	0.0	0.0	5616
20	0.0	0.0	5360
21	0.0	0.0	4985
22	0.0	0.0	3478
23	0.0	0.0	2717
24	0.0	0.0	2163
25	0.0	0.0	1748
26	0.0	0.0	1153
27	0.0	0.0	887
28	0.0	0.0	653
29	0.0	0.0	495
30	0.0	0.0	372
31	0.0	0.0	281
32	0.0	0.0	212
33	0.0	0.0	158
34	0.0	0.0	116
35	0.0	0.0	88
36	0.0	0.0	62
37	0.0	0.0	44
38	0.0	0.0	29
39	0.0	0.0	19
40	0.0	0.0	13
41	0.0	0.0	8
42	0.0	0.0	5
43	0.0	0.0	3

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

PRECIP(L) AND EXCESS(X)

Total volume
24hrs - 2336AF

TIME - HOURS

ROCKY BROOK SUB-AREA
HEC-1 Inputs

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO ROCKY BROCK

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
8	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISAME	LOCAL
0	-1	3.50	0.0	3.50	0.0	0.0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
16	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.89	1.07	1.16	1.34	1.70	4.94	1.16	1.16
0.95	0.50								

LOSS DATA

STRKS	DLTKS	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

GIVEN UNIT GRAPH, NUHGG= 48

0.	0.	0.	0.	13.	50.	106.	182.	272.	
402.	424.	409.	373.	327.	280.	240.	193.	162.	13
114.	95.	79.	66.	53.	45.	36.	32.	26.	24.
17.	15.	13.	11.	10.	8.	7.	6.		

UNIT GRAPH TOTAL = 4574. CFS OR 1.31 INCHES OVER THE AREA

RECESSION DATA

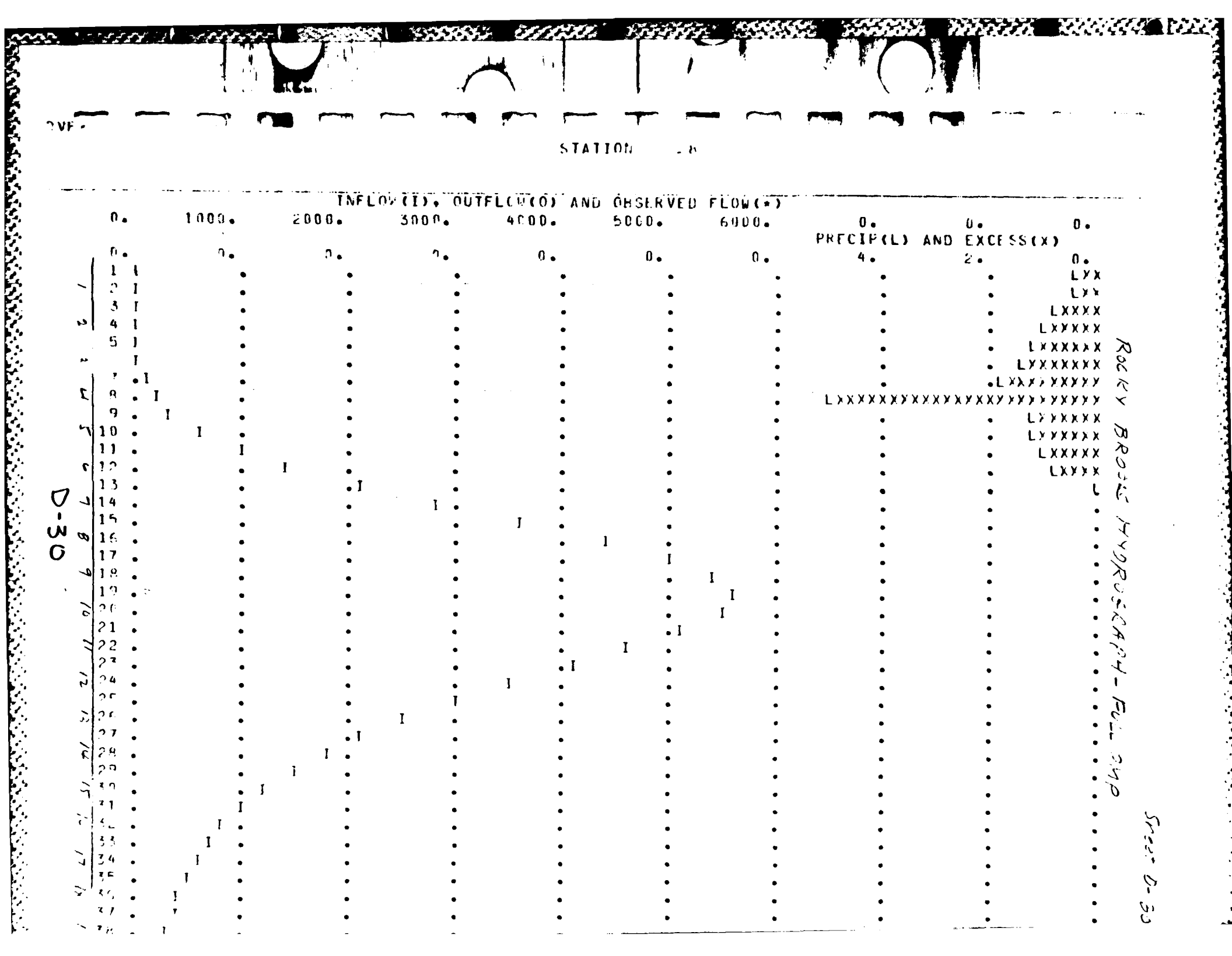
STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

ROCKY PROCH HYDROGRAPH - 5 -- PMF Sheet - D-29

TIME	END-OF-PERIOD FLOW RAIN	EXCS	LOSS
1	0.40	0.40	0.
2	0.40	0.40	0.
3	0.89	0.89	0.
4	1.07	1.07	0.
5	1.16	1.16	5.
6	1.34	1.34	25.
7	1.70	1.70	74.
8	4.94	4.94	174.
9	1.16	1.16	345.
10	1.16	1.16	600.
11	0.98	0.98	950.
12	0.80	0.80	1437.
13	0.0	0.0	2069.
14	0.0	0.0	2799.
15	0.0	0.0	3591.
16	0.0	0.0	4378.
17	0.0	0.0	5130.
18	0.0	0.0	5443.
19	0.0	0.0	5602.
20	0.0	0.0	5475.
21	0.0	0.0	5133.
22	0.0	0.0	4644.
23	0.0	0.0	4089.
24	0.0	0.0	3501.
25	0.0	0.0	2973.
26	0.0	0.0	2504.
27	0.0	0.0	2097.
28	0.0	0.0	1751.
29	0.0	0.0	1463.
30	0.0	0.0	1221.
31	0.0	0.0	1019.
32	0.0	0.0	844.
33	0.0	0.0	704.
34	0.0	0.0	592.
35	0.0	0.0	497.
36	0.0	0.0	421.
37	0.0	0.0	356.
38	0.0	0.0	295.
39	0.0	0.0	243.
40	0.0	0.0	204.
41	0.0	0.0	167.
42	0.0	0.0	137.
43	0.0	0.0	109.
44	0.0	0.0	87.
45	0.0	0.0	69.
46	0.0	0.0	31.
47	0.0	0.0	20.
48	0.0	0.0	11.
49	0.0	0.0	5.
50	0.0	0.0	0.
SUM	16.00	16.00	73167.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5502.	4388.	1525.	509.	73167
INCHES		11.56	15.21	16.21	16
AC-FT		2177.	3025.	3021.	3

D-29


STATION
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 1000. 2000. 3000. 4000. 5000. 6000.
0. 0. 0.
PRECIP(L) AND EXCESS(X)
4. 2. 0.
ROCKY BROOK HYDROGRAPH - FEB. 1949
Figure D-33
D-30

SUB-AREA RUNOFF COMPUTATION

INFLOW TO FIVE MILE BROOK

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	4.50	0.0	4.50	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.40	0.40	0.69	1.07	1.16	1.34	1.70	4.94	1.16	1.16
0.98	0.80								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.0	0.0	0.0	0.0

GIVEN UNIT GRAPH, NUHGG= 60

5.	13.	27.	46.	71.	105.	134.	171.	209.	247.
272.	291.	305.	311.	307.	297.	283.	265.	245.	227.
205.	183.	165.	149.	134.	123.	110.	100.	91.	81.
73.	67.	60.	54.	46.	42.	38.	34.	31.	29.
26.	23.	22.	20.	18.	16.	15.	13.	11.	10.
10.	9.	8.	7.	6.	6.	5.	5.	4.	4.
4.	3.	3.	3.	2.	2.	2.	2.		

UNIT GRAPH TOTALS = 5905. CFS OR 1.02 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

D-31

FIVE MILE BROOK - HEC-1 inputs

Sheet D-31

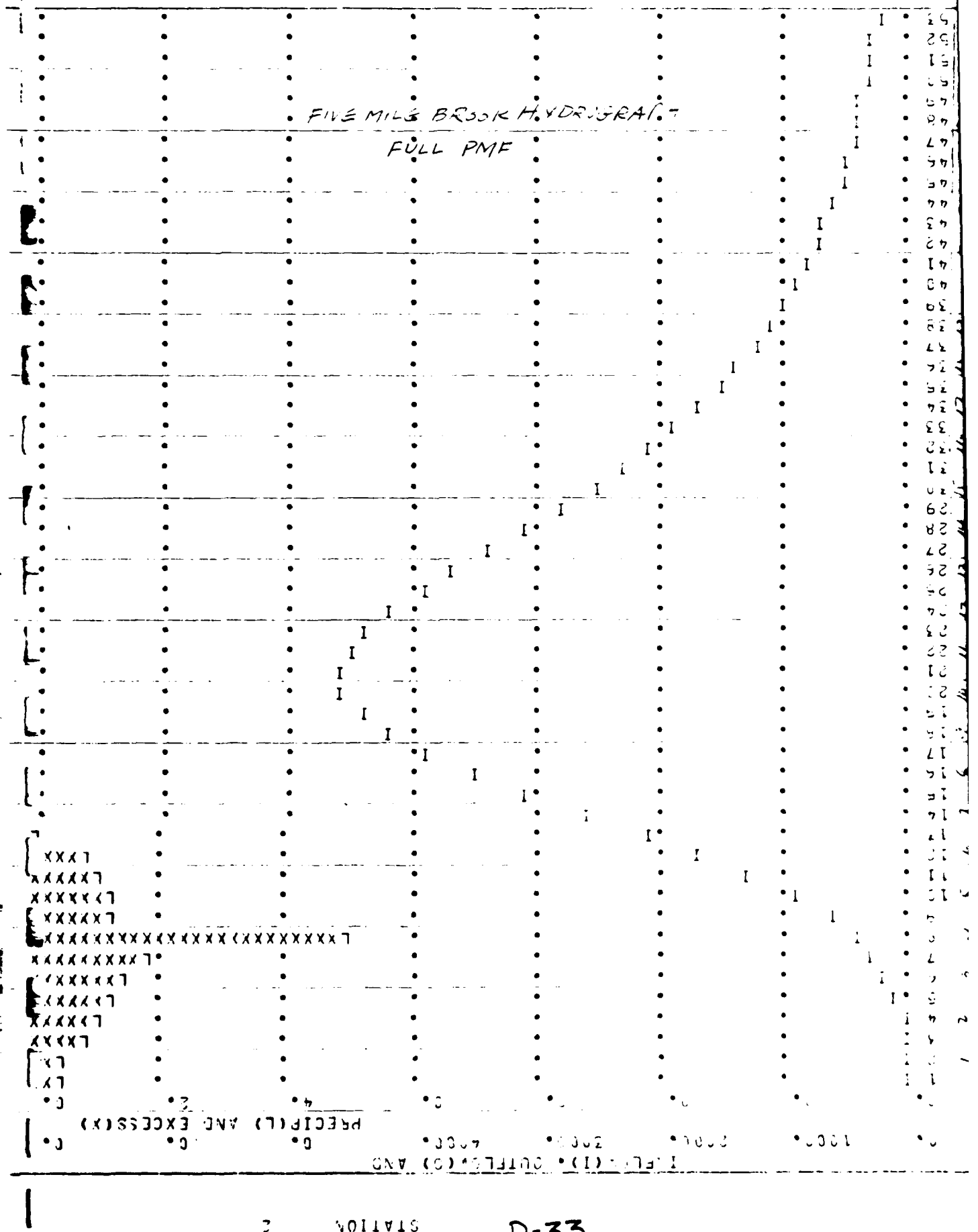
FIVE MILE BROOK HYDROGRAPH FULL DAY

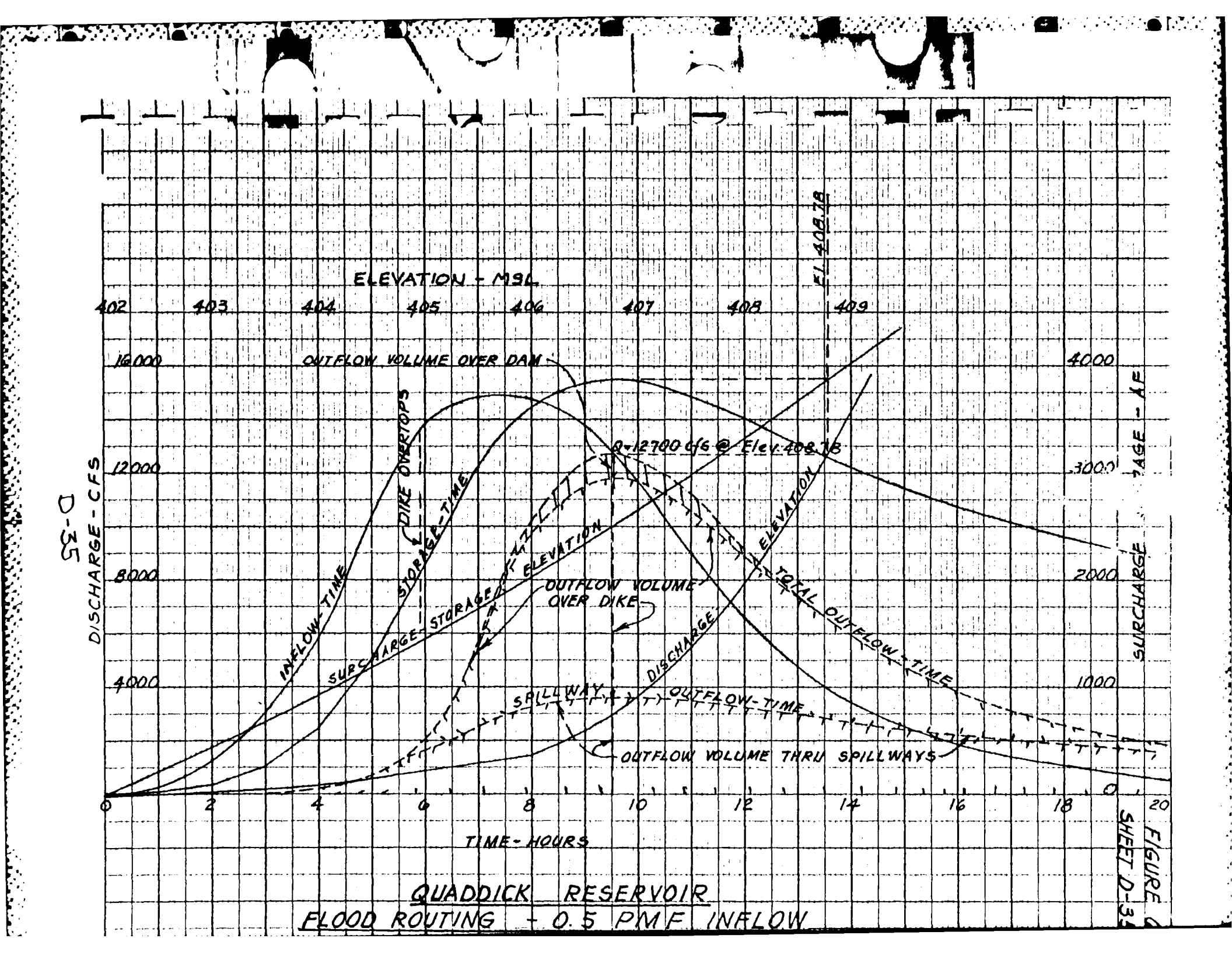
END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.40	0.40	1.
2	0.40	0.40	5.
3	0.89	0.89	19.
4	1.07	1.07	44.
5	1.16	1.16	88.
6	1.34	1.34	159.
7	1.70	1.70	262.
8	4.94	4.94	418.
9	1.16	1.16	641.
10	1.16	1.16	925.
11	0.98	0.98	1270.
12	0.80	0.80	1676.
13	0.0	0.0	2135.
14	0.0	0.0	2587.
15	0.0	0.0	3060.
16	0.0	0.0	3513.
17	0.0	0.0	3920.
18	0.0	0.0	4224.
19	0.0	0.0	4446.
20	0.0	0.0	4581.
21	0.0	0.0	4614.
22	0.0	0.0	4545.
23	0.0	0.0	4401.
24	0.0	0.0	4197.
25	0.0	0.0	3946.
26	0.0	0.0	3667.
27	0.0	0.0	3385.
28	0.0	0.0	3089.
29	0.0	0.0	2799.
30	0.0	0.0	2535.
31	0.0	0.0	2292.
32	0.0	0.0	2067.
33	0.0	0.0	1873.
34	0.0	0.0	1689.
35	0.0	0.0	1529.
36	0.0	0.0	1382.
37	0.0	0.0	1244.
38	0.0	0.0	1121.
39	0.0	0.0	1014.
40	0.0	0.0	911.
41	0.0	0.0	814.
42	0.0	0.0	734.
43	0.0	0.0	656.
44	0.0	0.0	591.
45	0.0	0.0	532.
46	0.0	0.0	482.
47	0.0	0.0	440.
48	0.0	0.0	398.
49	0.0	0.0	360.
50	0.0	0.0	331.
51	0.0	0.0	301.
52	0.0	0.0	272.
53	0.0	0.0	245.
54	0.0	0.0	224.
55	0.0	0.0	199.
56	0.0	0.0	177.
57	0.0	0.0	160.
58	0.0	0.0	148.
59	0.0	0.0	133.
60	0.0	0.0	120.
61	0.0	0.0	108.
62	0.0	0.0	97.
63	0.0	0.0	90.
64	0.0	0.0	80.
65	0.0	0.0	74.
66	0.0	0.0	65.
67	0.0	0.0	61.
68	0.0	0.0	56.
69	0.0	0.0	48.
70	0.0	0.0	44.
71	0.0	0.0	39.
72	0.0	0.0	31.
73	0.0	0.0	27.
74	0.0	0.0	23.
75	0.0	0.0	19.
76	0.0	0.0	9.
77	0.0	0.0	5.
78	0.0	0.0	4.
79	0.0	0.0	2.
80	0.0	0.0	0.
SUM	16.00	16.00	54477.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4614.	4120.	1524.	656.	54478.
INCHES		6.52	15.91	16.28	16.28
AC-FT		2044.	3818.	3953.	3953.

Sheet D-33





D-35

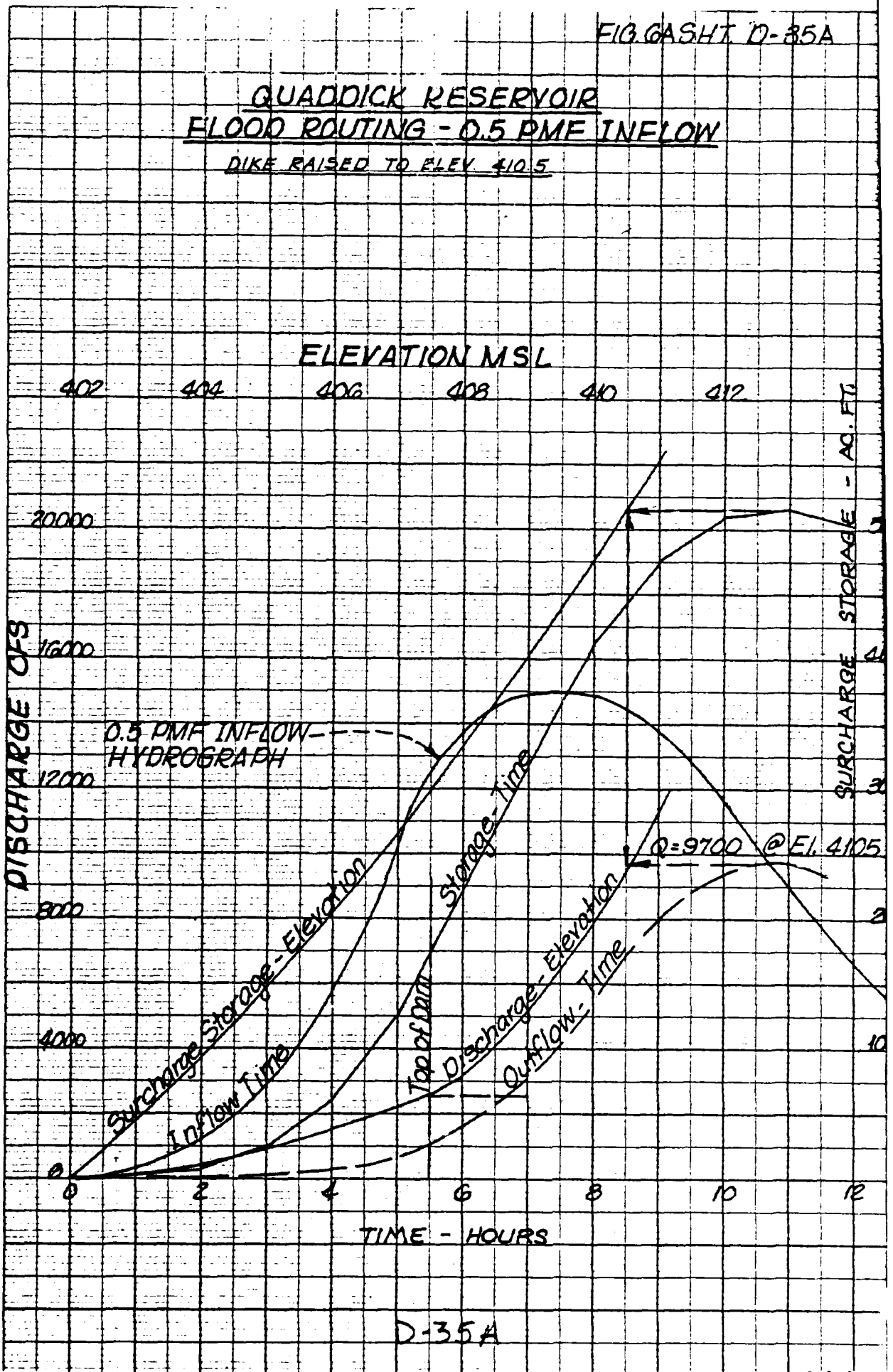
QUADDICK RESERVOIR

FLOOD ROUTING - 0.5 PMF INFLOW

FIGURE D-33 SHEET D-33

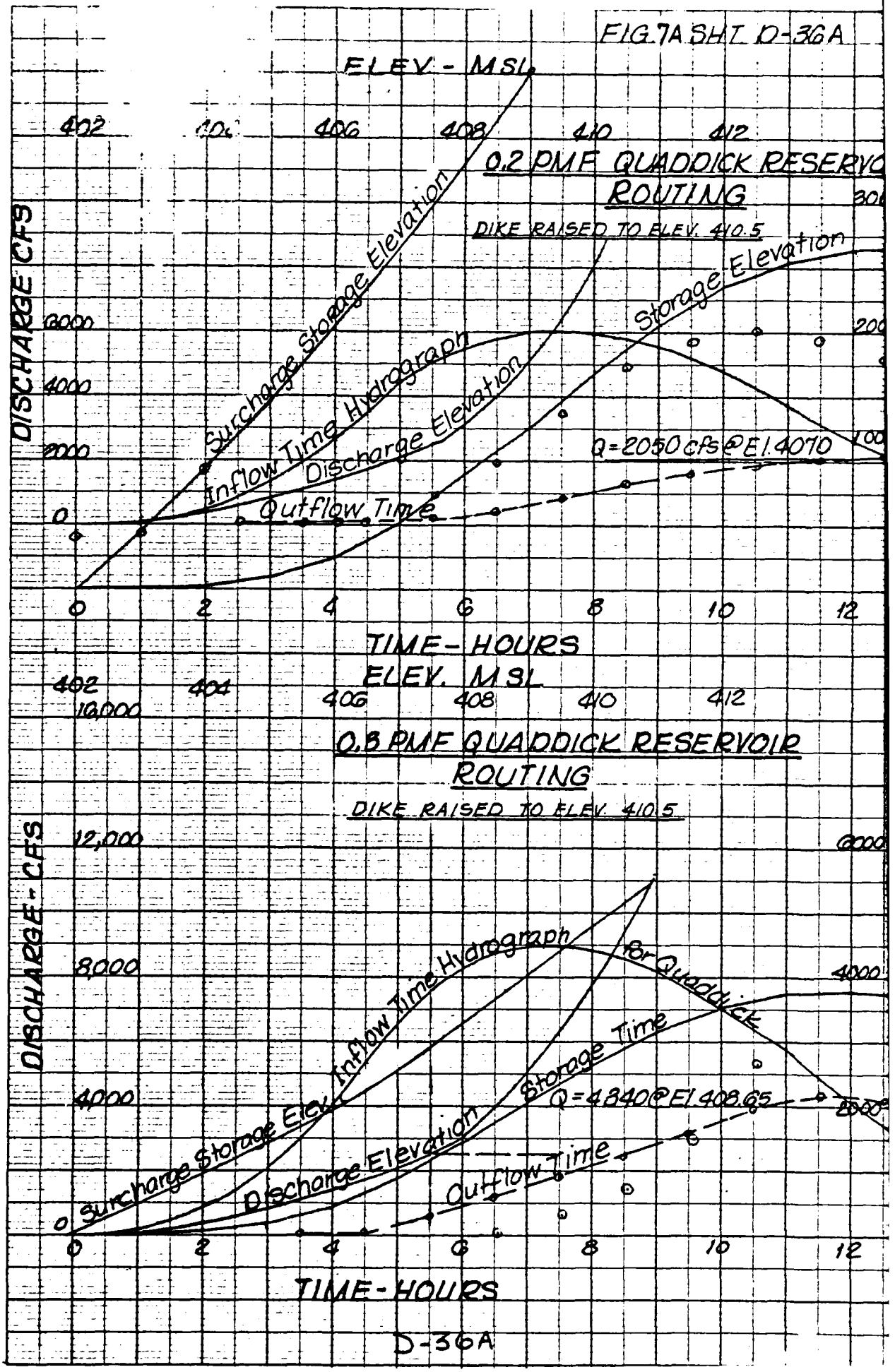
FIG 6A SHT D-35A

QUADDICK RESERVOIR
FLOOD ROUTING - 0.5 PMF INFLOW
DIKE RAISED TO ELEV. 410.5



D-35A

FIG. 7A SHT. D-36A



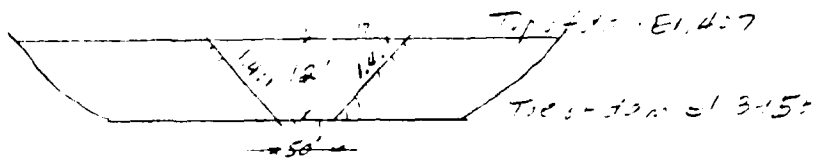
D-36A

BY _____ DATE _____ **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. _____

CHKD. BY _____ DATE _____ INSPECTION OF DAMS - CLASS 3 PROJECT _____

SUBJECT QUABBIN RESERVOIR DAM - EMERGENCY PLAN

BREACH FAILURE OF DAM



Breach failure per NEA "Rule of Thumb"

$$Q_p = \frac{8}{27} W_b \sqrt{2g}\, y_o^{3/2} = 1.68\, W_b\, y_o^{3/2}$$

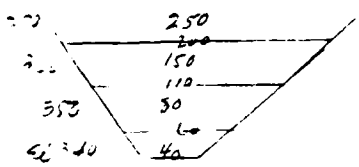
Q = $1.68 \times 50 \times 12^{3/2}$ = 3492

Q = $\frac{1.68 \times 12^{3/2}}{2} \times 17 \times 2$ = 1187

4679 Say 5000 cfs

River stage - discharge at dam near Pinevale

(At dam near Putnam Rd + River Rd crossing)

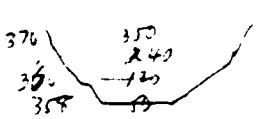


Assumed Slope = 26'/mile = .005 $S^{1/2}$ = .07 n = 0.075

$Q = \frac{1.49}{n} r^{2/3} S^{1/2} = 20\, r^{2/3}$

Elev	Width	Δ Area	Σ Area	W.P	r	$r^{2/3}$	Q
340	40		0				
345	60	250	250	62.4	4.01	2.52	50
350	80	350	600	84.8	7.08	3.68	3053
355	110	475	1075	116.4	9.23	4.40	6330
360	150	650	1725	157.6	10.78	4.90	9450
365	200	875	2575	208.6	12.34	5.34	13712

Critical flow at Stone Road + Tunnel - District Crossing



$\frac{A^3}{T} = \frac{Q^2}{g}$ $Q = \sqrt{\frac{A^3 g}{T}}$

EL	T	Δ Area	Σ Area	Q_c
350	120	170	170	1148
355	240	900	1070	12820
370	350	1475	2545	38940

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY | MO | YR
CT	184	NED	CT	015	02				QUADDICK RESERVOIR DAM	4156.5	7149.7	14MAR79

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT
	QUADDICK RESERVOIR

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	07	FIVE MILE RIVER	PINEVILLE	4	1000

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES (27) MAXIMUM (ACRE–FT.)	(27) NORMAL (ACRE–FT.)
RECTPG	1900	R	12	12	5100	2140

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	14MAR79

(28) REMARKS
22-ESTIMATE

(29) O/S HAS	(30) SPILLWAY CREST LENGTH (FT.)	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
2	330	U	71	2500	5720											

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
STATE OF CONN, DEP		

(49) REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

(50) INSPECTION BY	(51) INSPECTION DATE DAY | MO | YR	(52) AUTHORITY FOR INSPECTION
LOUIS BERGER + ASSOCIATES, INC.	07NOV78	PL92-367

(53) REMARKS

This Phase I Inspection Report on Ouaddick Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH A. MCELROY, CHAIRMAN
Chief, NED Materials Testing Lab.
Foundations & Materials Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

JUN 25 1979

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

I am forwarding to you a copy of the Quaddick Reservoir Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, the State of Connecticut, Department of Environmental Protection, Hartford, Connecticut 06115, ATTN: Mr. Stanley J. Pac, Commissioner.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

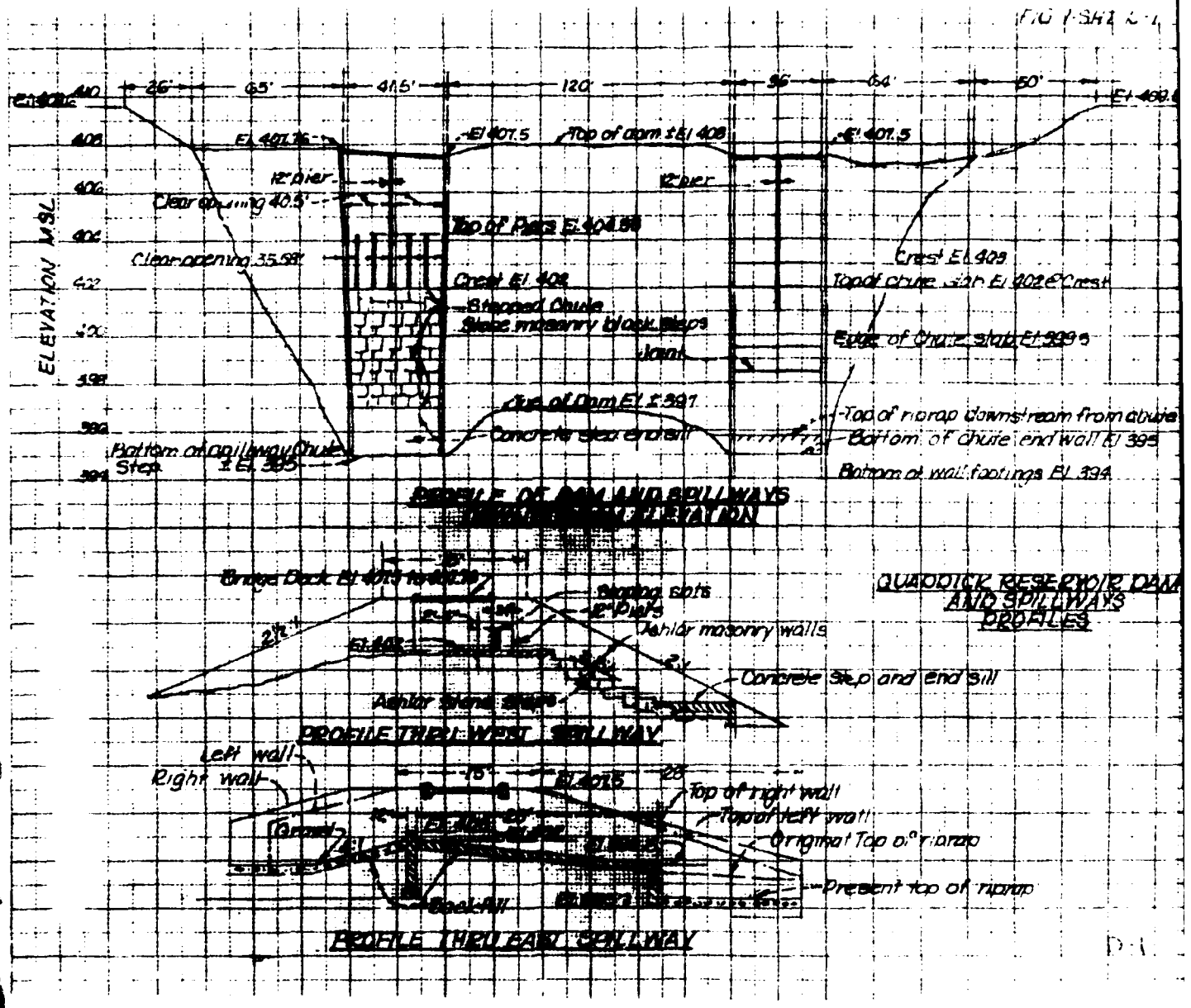
I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

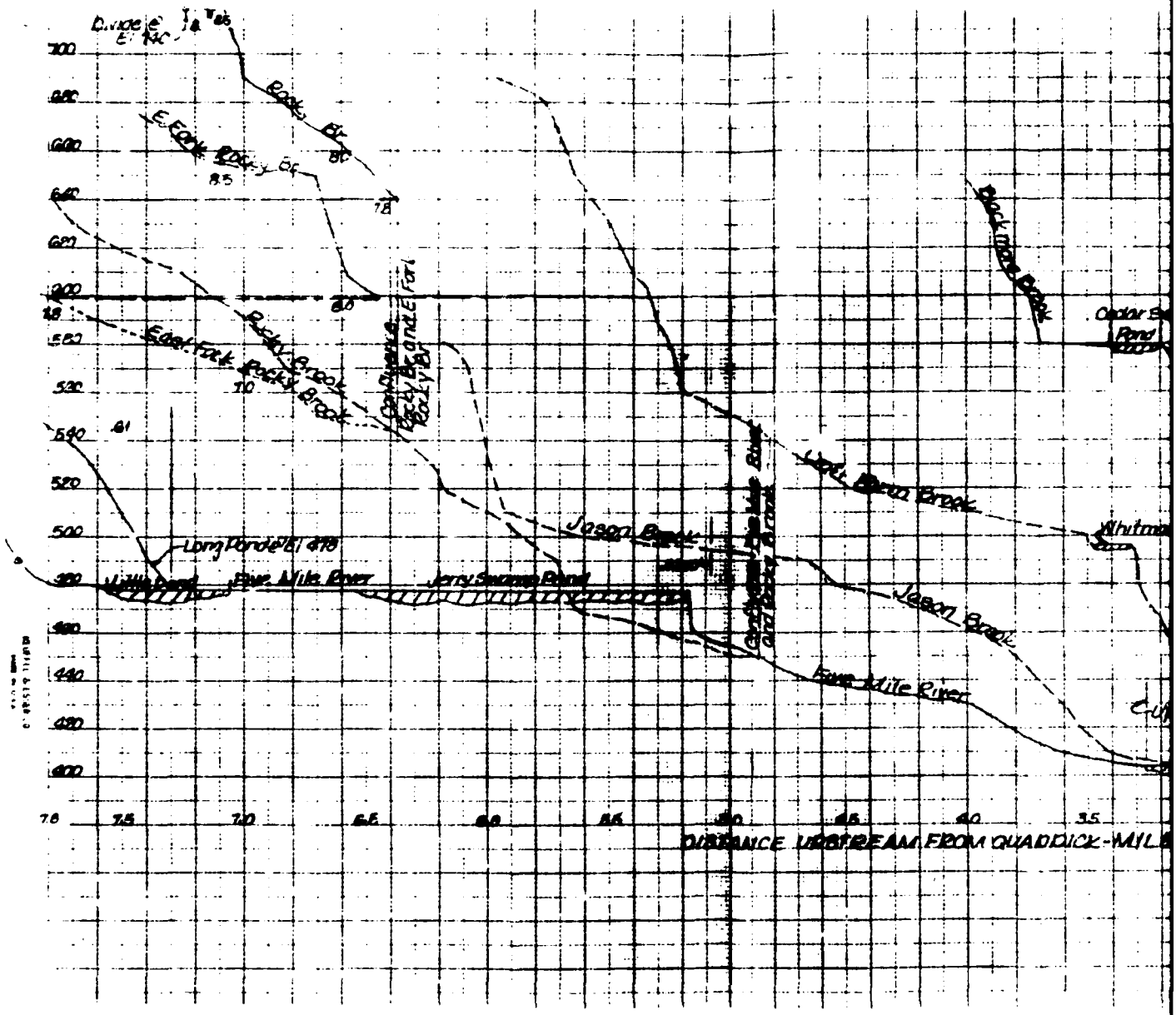
Incl
As stated

FIG 1 D-1


ELEVATION MSL
26'
65'
415'
120'
56'
64'
50'
El 407.5
Top of dam ± El 408
12' piers
Clear opening 40.5'
Clear opening 35.58'
Top of Piers E. 404.58
Crest El 408
Stepped Chute
Slope masonry block steps
Joint
Crest El 409
Top of chute slab El 402 @ Crest
Edge of Chute slab El 399.5
Axis of Dam El ± 397
Concrete Step and Sill
Top of riprap downstream from chute
Bottom of chute end wall El 395
Bottom of wall footings El 394
Bottom of spillway Chute Step ± El 395
PROFILE OF DAM AND SPILLWAYS
QUACHITA RESERVOIR DAM
AND SPILLWAYS
PROFILES
Bridge Deck El 409 ± width 30'
Blocking slots
Ashlar masonry walls
Concrete Step and End Sill
Ashlar Stone Steps
PROFILE THRU WEST SPILLWAY
Left wall
Right wall
15'
El 407.5
28'
Top of right wall
Top of left wall
Original Top of riprap
Present top of riprap
Backfill
PROFILE THRU EAST SPILLWAY
D-1

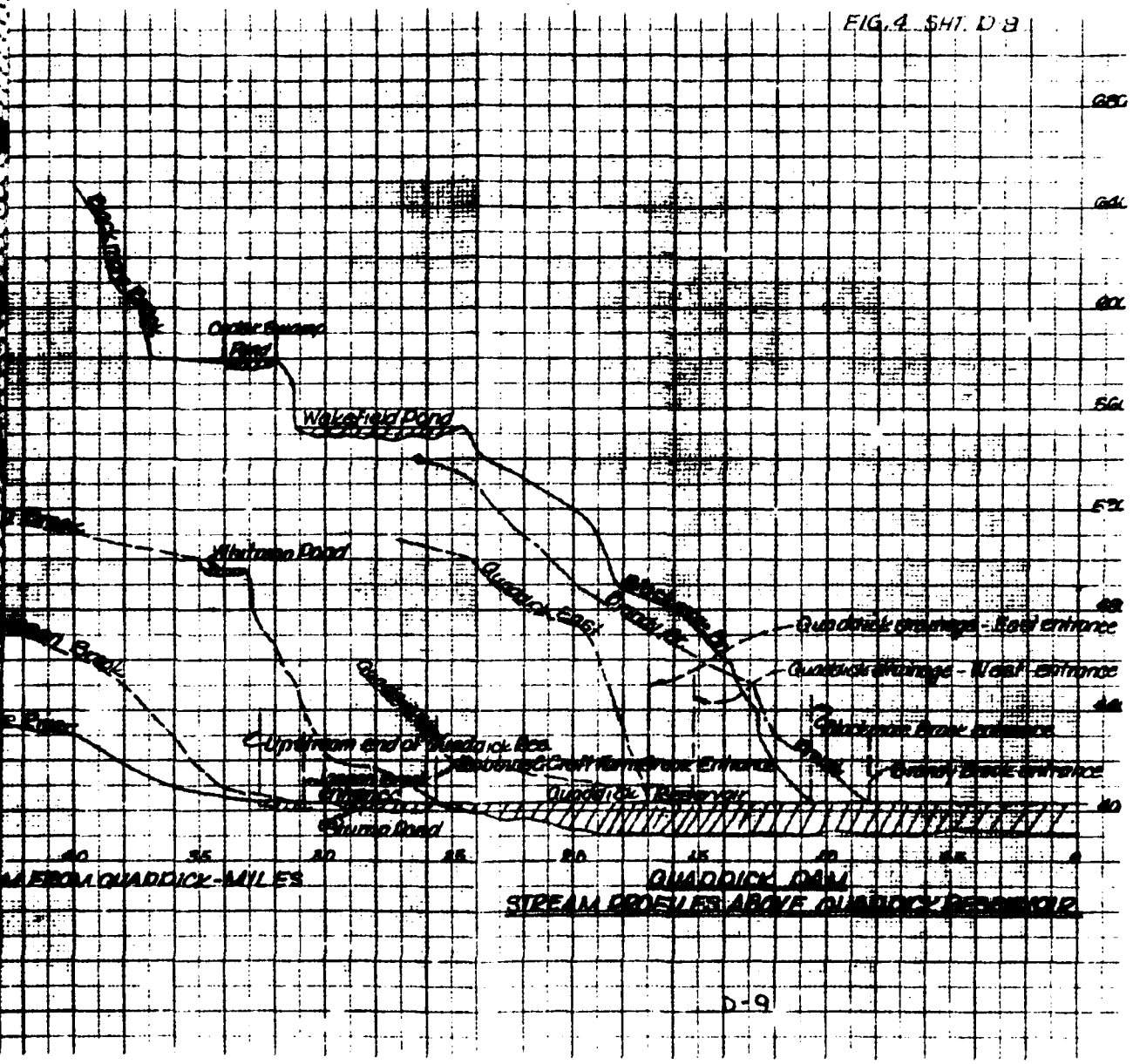
1 of 1

FIG 4 sheet D-8



1 of 2

FIG. 4 SHT. D 8



2 of 2

FIG 5

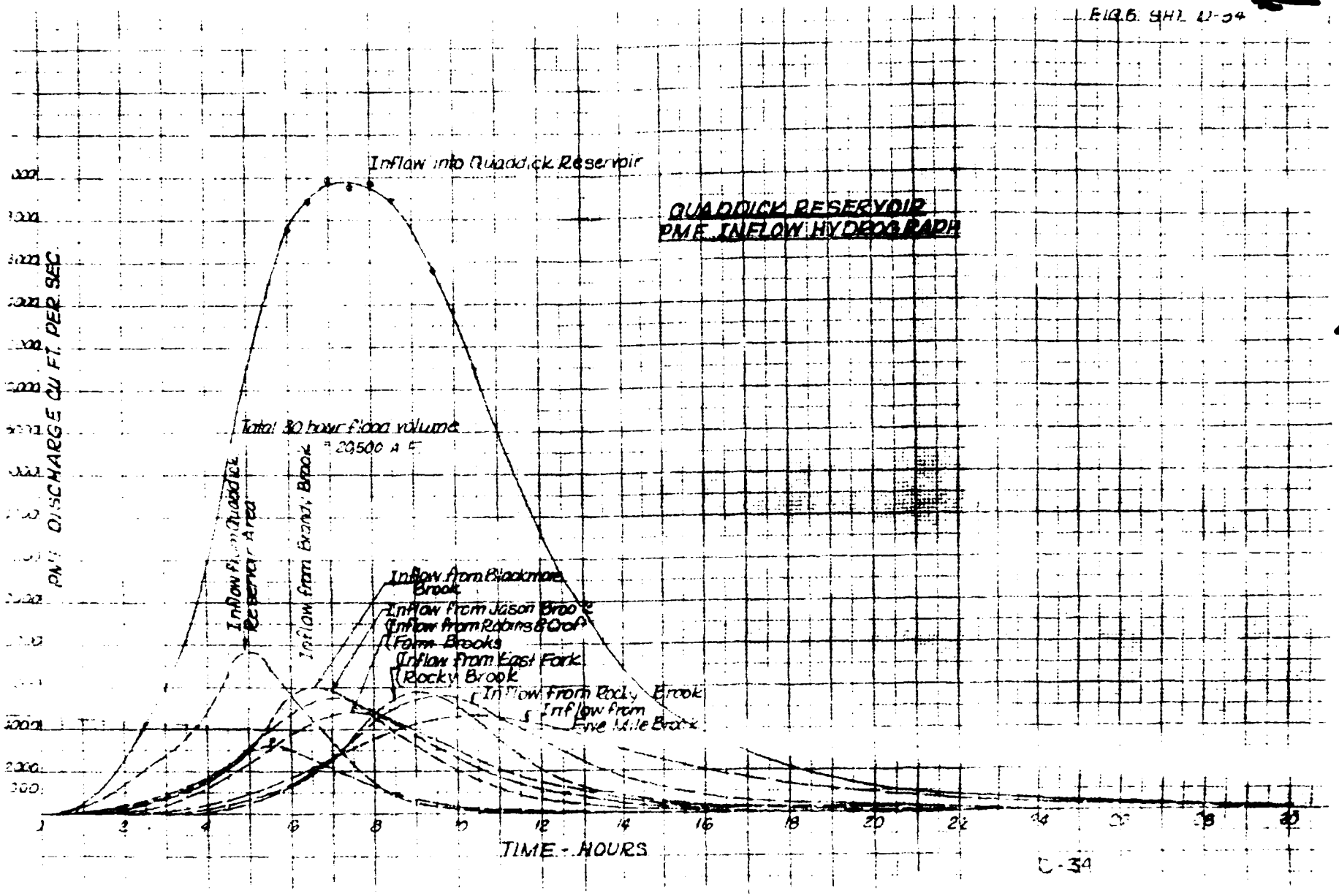

E.I.G.B. SHT. U-34
QUADDICK RESERVOIR
PMF INFLOW HYDROGRAPH
Inflow into Quaddick Reservoir
Total 30 hour flood volume
= 20500 A F
Inflow from Quaddick Reservoir Area
Inflow from Bronx Brook
Inflow from Blackmore Brook
Inflow from Jason Brook & Inflow from Rooms & Out Farm Brooks
Inflow from East Fork Rocky Brook
Inflow from Rocky Brook
Inflow from Five Mile Brook
PMF DISCHARGE CU FT PER SEC
TIME - HOURS
U-34

FIG 5 SHT D34

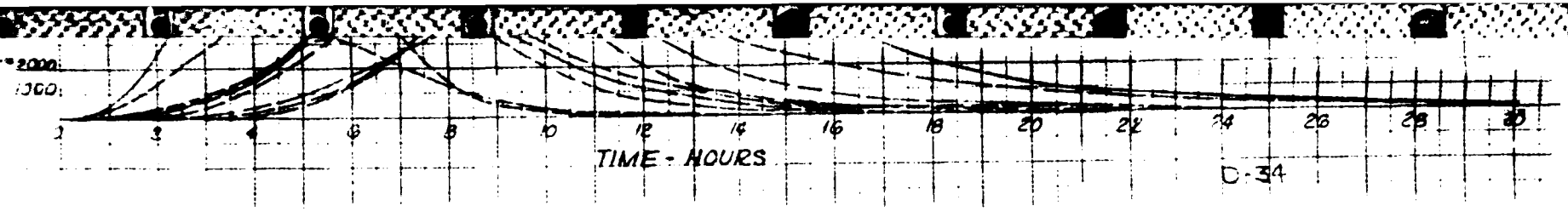


FIG 5 SHT D-34

QUADDICK RESERVOIR
PMF INFLOW HYDROGRAPH

Inflow into Quaddick Reservoir

Total 80 hour flood volume
= 20500 A.F.

Inflow from Quaddick Reservoir Area

Inflow from Brandy Brook

Inflow from Blackmans Brook

Inflow from Jason Brook

Inflow from Cabinet Croft Farm Brooks

Inflow from East Fork Rocky Brook

Inflow from Rocky Brook

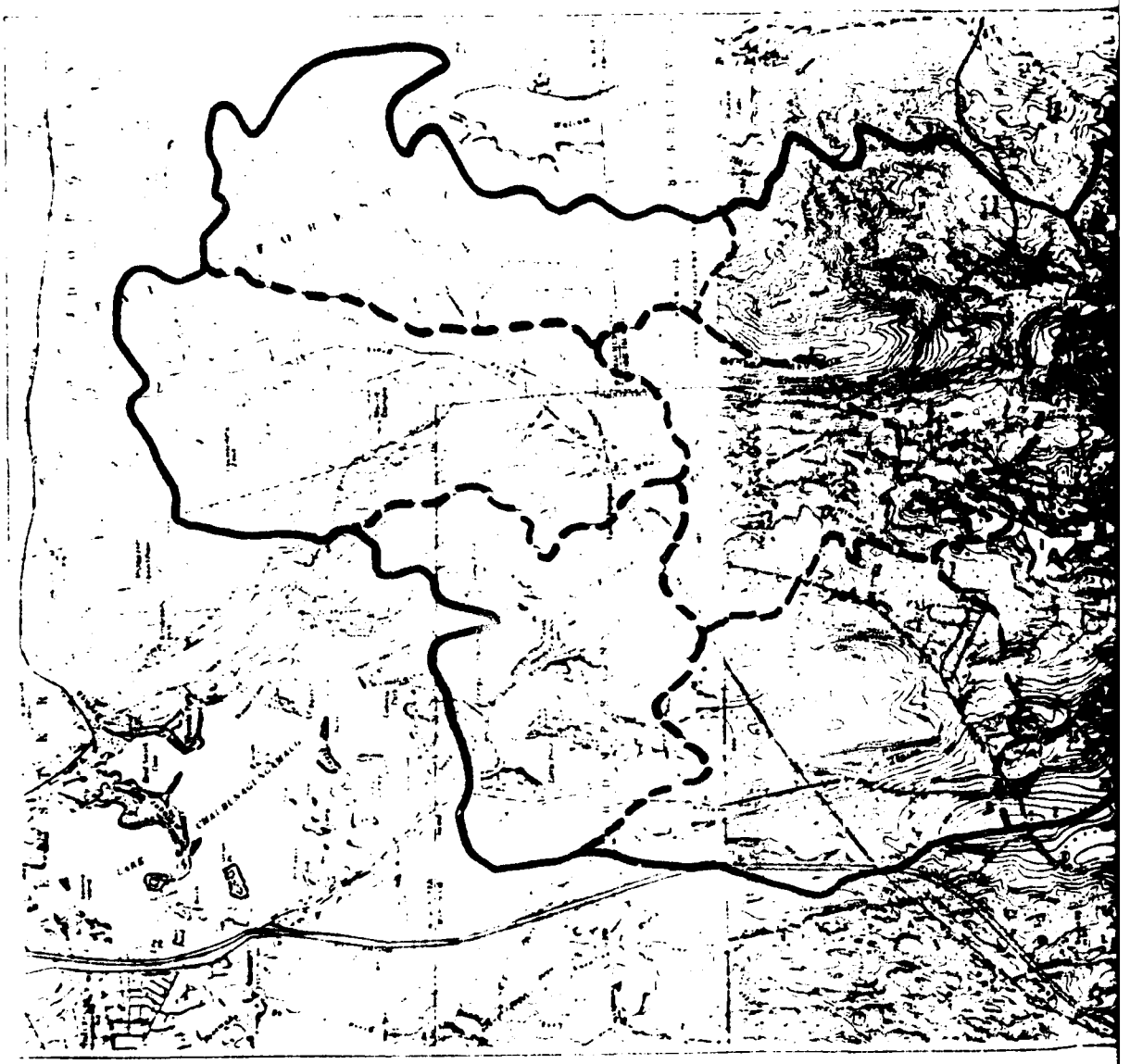
Inflow from Five Mile Brook

PMF DISCHARGE CU. FT. PER SEC.

TIME - HOURS

D-31

2472



F19. 9 Sheet D-38

1 of 2

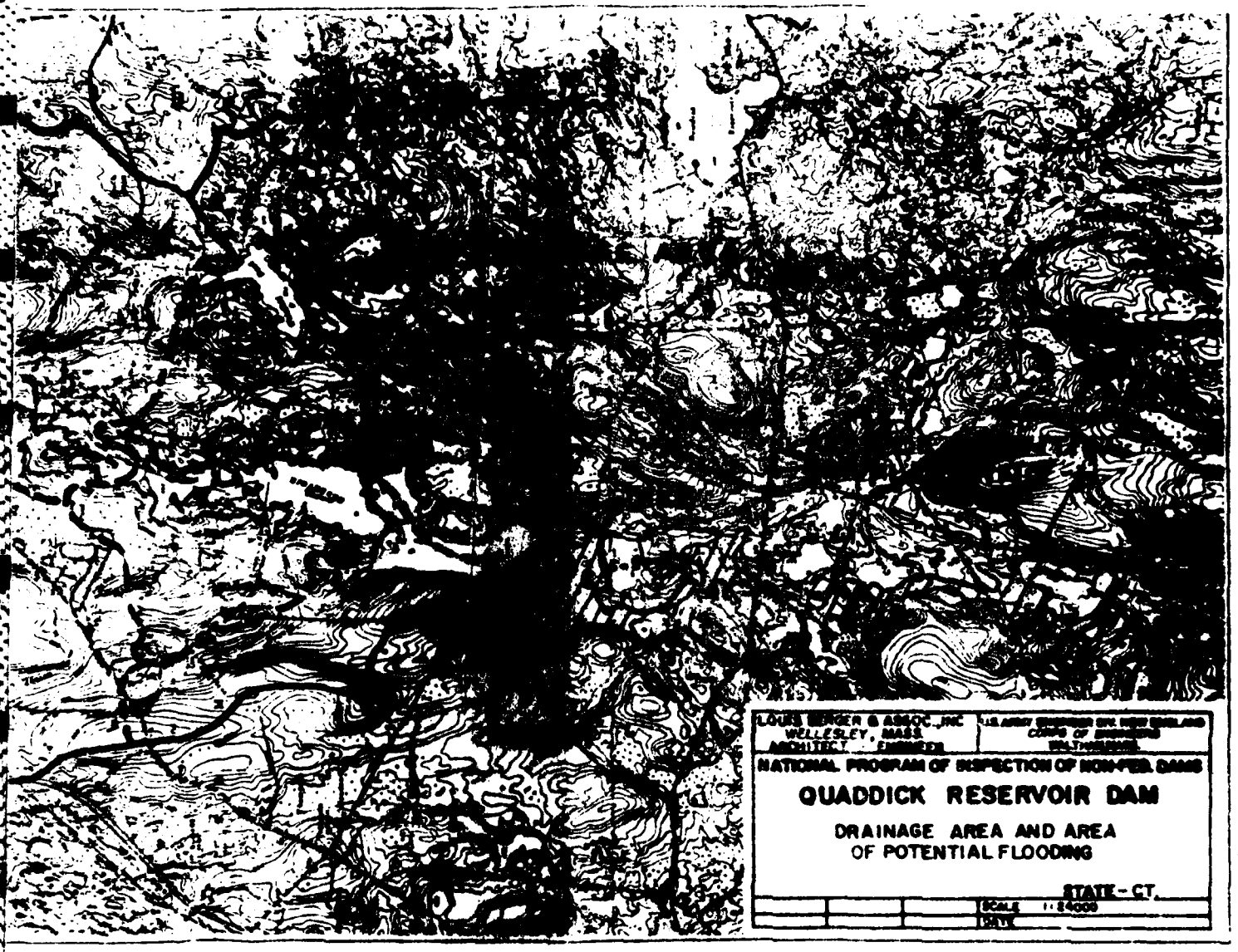
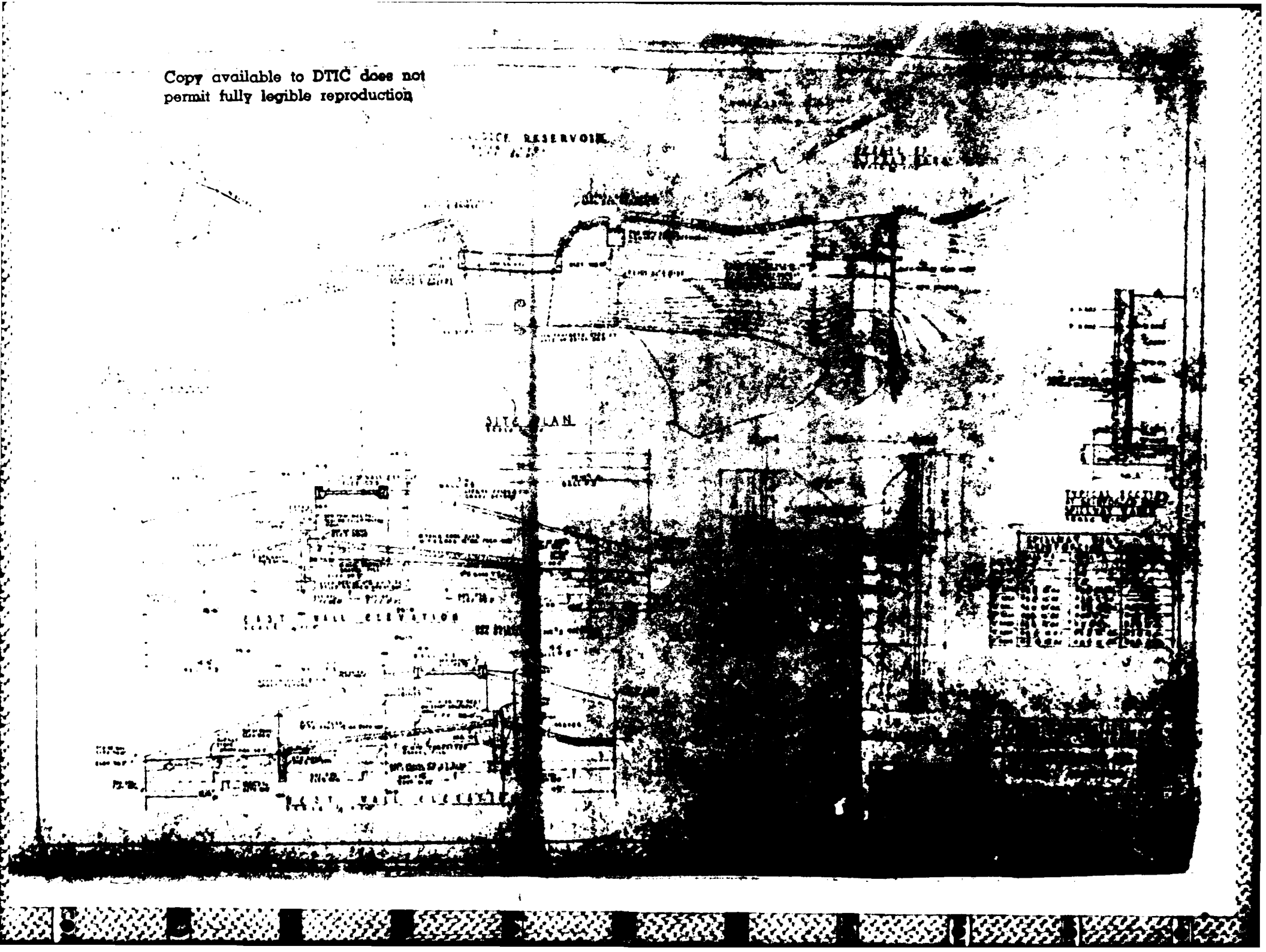
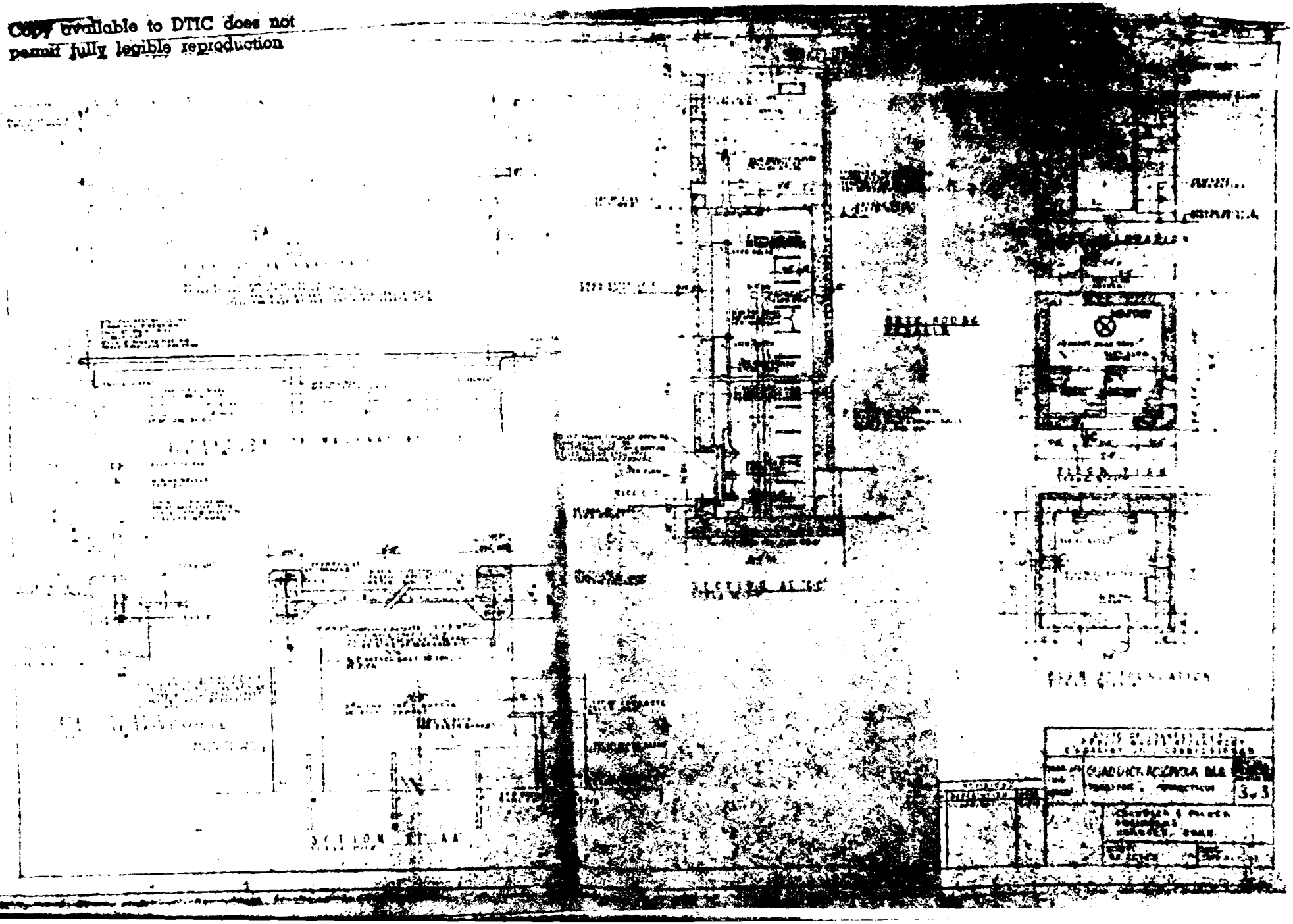
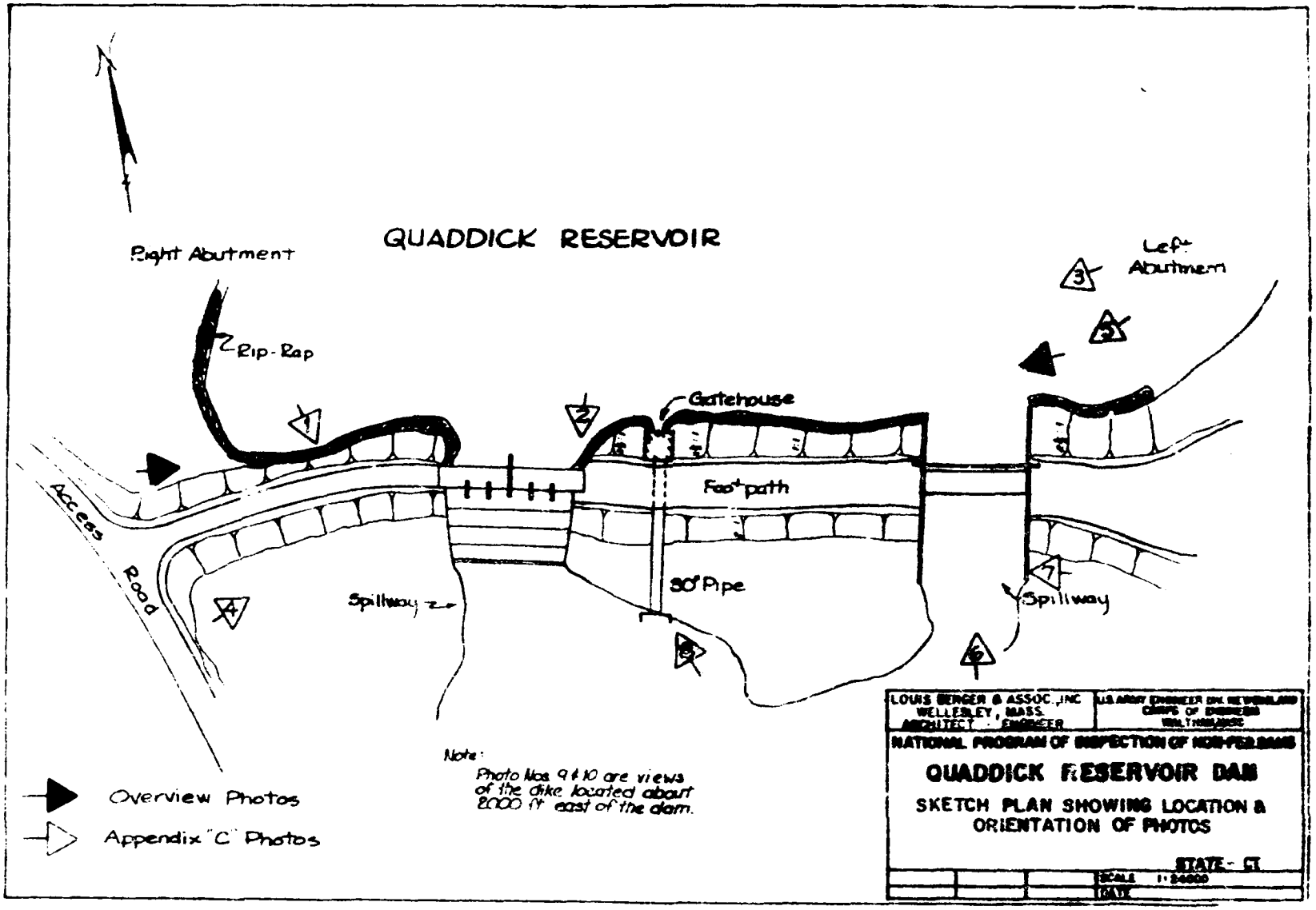


FIGURE 9 - SHEET D-38

2 of 2






QUADDICK RESERVOIR
Right Abutment
Rip-Rap
Gatehouse
Left Abutment
Foot path
Access Road
Spillway
30" Pipe
Spillway
Overview Photos
Appendix "C" Photos
Note:
Photo Nos. 9 & 10 are views of the dike located about 8000 ft. east of the dam.
LOUIS BERGER & ASSOC., INC.
WELLESLEY, MASS.
ARCHITECT - ENGINEER
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
QUADDICK RESERVOIR DAM
SKETCH PLAN SHOWING LOCATION & ORIENTATION OF PHOTOS
STATE - CT
SCALE 1" = 2000'
DATE